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A journal of transport timetable history and analysis

Inside: By Horse Coach to Rosedale

The girl who changed the Timetable World

The Paradox of Efficiency

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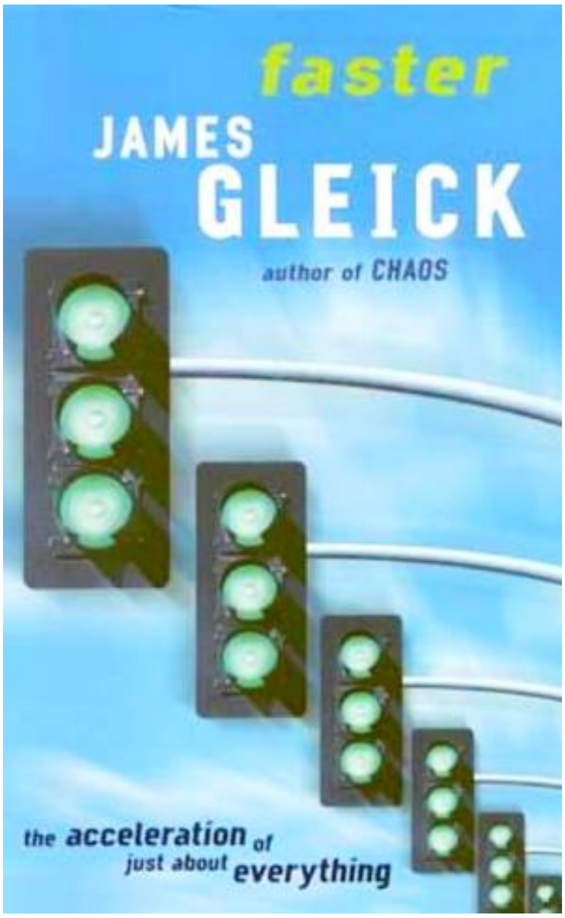

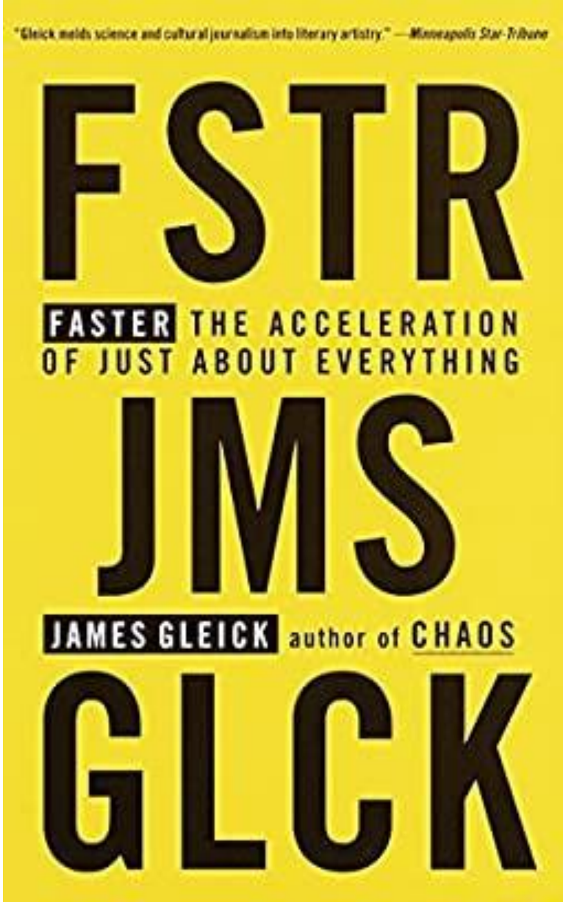

A Cobb and Co Coach Trip from Melbourne to Rosedale in 1873 *By* **Innes Cameron, Thomas Mills and Geoff Lambert**

GIPPSLAND WITH ITS WET soils and swampy plains made road travel a nightmare and our early roads were often paved with corduroy. Not the type used to make trousers but logs of wood laid sideways across the tracks.

The horses were kept at a gallop so imagine the jostling and pitching inside a carriage over the logs. The journey between Melbourne and Rosedale took 33 hours, stopping only to eat and change horses. As the logs perished more logs would be placed directly on top. In the 1950s, when areas of the main Gippsland road were repaired, the workmen found up to 15 feet (5 metres) of corduroy.

The following article was published on page 12 of The Melbourne Argus on the 10th of March 1945.

"I tried to get a nap to help pass away the dreary time, but with the jerking of the coach and the tumbling about of the luggage inside, and the splashing of dirt from the wheels, sleep was out of the question." So Thomas Mills wrote in his diary in the year 1873. It was Cobb and Co's Gippsland run and the 150 mile trip to Rosedale took nearly two days.

Thomas Mills (picture, right), an Englishman, was manager of Heyfield Station, owned by James Tyson. Perhaps because he was a newcomer to the colonies, he was more prejudiced against the rough tracks through the Australian forest that served for roads. But he became acclimatised without loss of time, for Harry Peck wrote of him: "When he arrived off the ship he was so green that when the boys put his saddle on back to front he tried to ride in it." But Mills became a good manager and an excellent judge of stock.

At 1 o'clock [the timetable says 1.30] on a fine September day he boarded the coach at the old Albion Hotel in Bourke St. The whip cracked and the horses set off at a good pace down the hill. Mills said people in the street

"quizzed" them for the "reason that they had done the journey themselves and did not envy the travellers."

"Going at a good galloping speed through St Kilda soon opened up the country, and after an hour's run brought us to the pretty little village called Oakleigh. Here we delivered mails and exchanged horses. "At 5 o'clock we reached the small village of Dandenong.

"We reached the next stage, Berwick, at 8 o'clock. The horses were changed, but no time was allowed for refreshments.

"Patience is a virtue – so I thought, as we pulled up at the longed for stage called Bunyip Creek. I was not long finding my way into the parlour of the comfortable inn, where a blazing log fire was burning to welcome weary travellers. The table was spread with a fine joint of beef and potatoes. We eagerly did justice to it, and followed it by a good cup of tea. I drew up to the fire, prepared to have a warm, when the driver called, 'All on board!' so we had to go or be left behind.

"Later on, we passed the homeward [Melbourne] bound coach on the road, and were warned by the driver that the roads were very bad indeed. We were not long in finding that out!, for the coach came to a sudden stop.

*"The coachman jumped down, and when I heard him exclaim, '**Here's a bonnyfix**!' I jumped down, too. I landed up to my ankles in thick mud to find that a sapling had become tangled in the wheels of the coach. Axes were brought out, and after an hour's work the wheels were free. Every mile the*

road got worse, and it was with great exertion on the part of the horses that we arrived at Brandy Creek.

"We changed horses, and, as a passenger left here, I took his seat on the box, thinking that the time and journey would not be so fatiguing. But in this I was disappointed. It was now 1 o'clock at night and very cold.

"I was delighted when morning dawned, and felt better able to bear my troubles. The forest seemed full of life. Wild birds sang, cockatoos shrieked, there came the unearthly row of the laughing jackass and the scrambling of monkey bears.

"By 9 o'clock we reached the small village of Shady Creek, where there was just time for a warm.

"When we started I took an inside seat, as I could not keep my eyes open. I thought I might get a nap by sleeping on the mailbags, but it was quite impossible owing to loose boxes and parcels falling about.

"I became very sick, and was pleased when we pulled up at the village of Moe, and it was a source of great gratification to me when I became aware that the worst perils of our travels had been attained. "My spirits began to revive, knowing that in a few hours my troubles would cease.

"At Traralgon village we had a few minutes refreshment, then made another start for the last stage for me. An hour's run brought us to Rosedale, where horses were waiting to take us to our destination at Heyfield.

"The 33 hours in a stage coach across the Australian forest was quite enough to satisfy my ambitions in that direction."

Word was sent through Rosedale post-office for horses to meet incoming travellers. Thomas Mills had a further ride of 12 miles before he could arrive at his destination. But food and warmth waited for him behind the sturdy stone walls of the old station on the banks of the Thompson River. It maintained the reputation of lavish hospitality of those days.

Editor's notes

Cobb and Co did produce timetable booklets, but the only surviving copy seems to be for Western Victoria.

I could find no timetable for the Gippsland service in old newspapers, except a mention of the departure time of 13:30 in one advertisement in the Argus of 20th November 1865. This is half an hour later than the time stated by Mills for his 1873 journey. The time taken, according to that advertisement, was 36 hours.

Immediately below that advertisement was another advertisement for a MWF journey taking only 24 hours to Sale and calling at the places shown in the table at upper right.

Given that the article was written in 1945 and that the author was transcribing from a diary written at some indeterminate time after 1873, we nevertheless have a reasonable fit to what the Cobb and Co timetable **might** have looked like.

	Miles	Time	mph
		d:hh:mm	
Melbourne	0	0:13:00	
Oakleigh	9	0:14:30	6
Springvale	18		
Dandenong	20	0:17:00	4
Berwick	26	0:20:00	2
Pakenham	38		
Bunyip Creek	46		
Brandy Creek	63	1:01:00	5
Shady Creek	72	1:09:00	1
Moe	76		
Morwell	96		
Traralgon	104	1:21:30	3
Rosedale	116	1:22:30	13
Sale	133		
Total	116	1:09:30	3.5

The major anomaly seems to have been the time of 8 hours taken to travel the nine miles between Brandy Creek and Shady Creek. In addition, the introduction to the article seems to have rather inflated the total distance that Mills travelled on the journey. The average speed of the coach seems to fit very well, with those I calculated for a variety of NSW coach services in 1912 (The Times, September 2007).

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Queen Street Warragul in 1880 from station. Scanned from Forests Old Pastures New with permission for warragulcitizen.com

Pioneering Open Data Standards: *The GTFS Story By* **Bibiana McHugh**

Beyond Transparency

IN 2005, I WAS WORKING AT TriMet, the public transit agency in Portland, Oregon, as an IT manager for Geographic Information Services. Earlier that year, while traveling, I found it very frustrating to try and find transit directions in the unfamiliar cities I was visiting. This was especially true when transportation agencies that provided differing services or [served different] areas were not consolidated. It was much easier at that time to get driving directions from popular online mapping services, and I realized this was probably encouraging car usage over public transit.

In my role at TriMet, I worked with transit data every day, so I knew such data was available and the potential was there. We offered our own online transit trip planning tool, as many agencies do. The trouble was, the average citizen often didn't know where to go to find this information, especially if he or she was unfamiliar with the local transit system. The general public was used to going to certain online destinations for driving directions—Google Maps, MapQuest, and Yahoo were all widely used at the time—but the data they needed to plan a trip using public transit wasn't available where they were looking.

Bringing Data to the Citizens

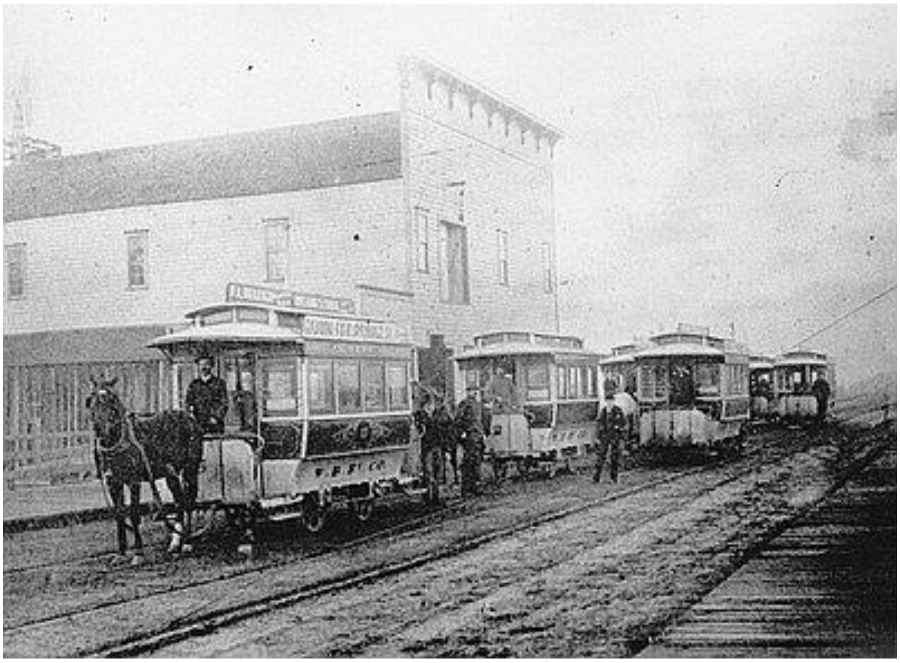
As a public servant who had worked to improve public transit for nearly a decade, I saw this as a missed opportunity to promote public transit to an audience that might not be aware of the option. When I returned to Portland, I made it my mission to make it just as easy to get transit directions as it is to get driving directions from anywhere in the world. I reached out to several companies to inquire about the idea of integrating Portland's public transit data into their existing navigation products in order to allow users to plan transit trips.

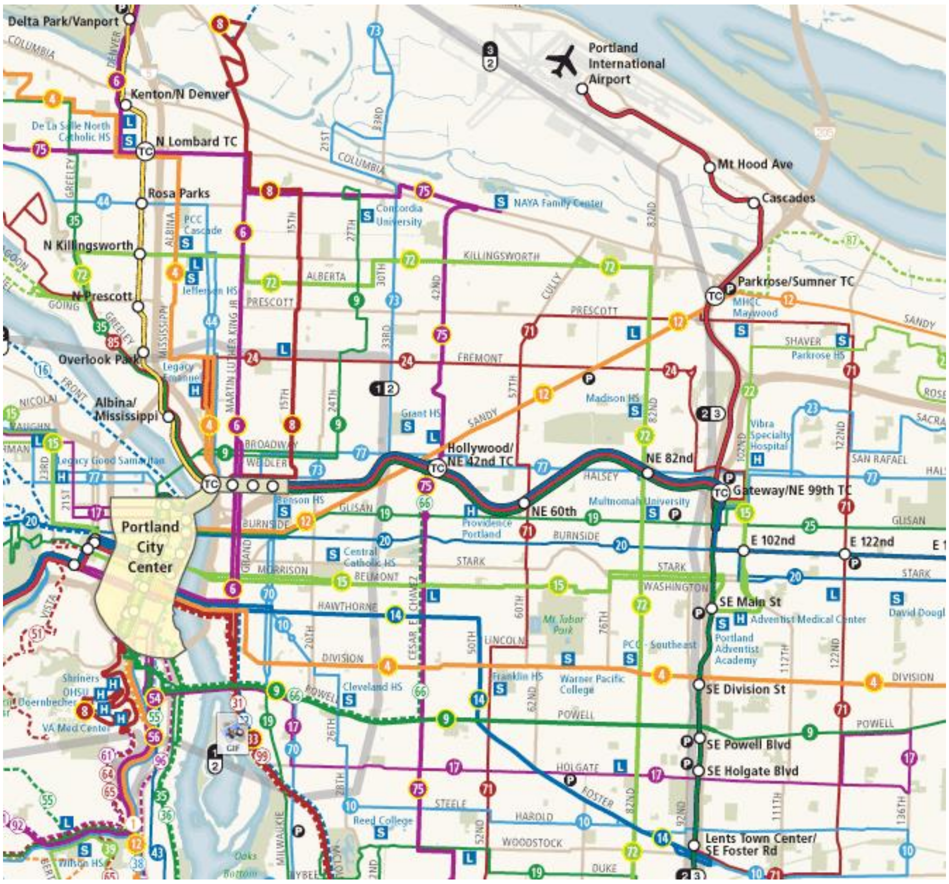
After some persistent follow-up with no response, I contacted Jeremy Faludi after reading his article "A Call for Open-Source Public Transit Mapping" (Faludi, 2005). He introduced me to Chris Harrelson, a software engineer at Google who had the same idea in mind. He and a group of like-minded volunteers had been working on building out a prototype of Google Transit during their twenty percent flexible project time. They had the idea and the basic infrastructure. What they needed to continue was a government partner who could provide service data (routes, timetables, etc.).

In July of 2005, we got together with the team at Google to discuss the project. At first, some of the TriMet staff were hesitant to hand over the data—it's very complex spatial-temporal data that is difficult to handle correctly. But when we saw that Chris' team knew what they were doing, we were very impressed. Tim McHugh, TriMet's Chief Technology Officer, generated the initial data export that same night—the beta version of what would eventually become the first widely used transit data standard.

TriMet already had an existing centralized enterprise database that housed all of the relevant data already pieced together in good form. Having this foundation in place was significant—only because of this was it possible to write an initial script in less than an hour that would export the data required for transit trip planning. We published this schedule data in the form of CSV files based on our existing internal database schema and shared it with Google, as well as publicly on our website, so that any third-party developer could access and use it.

The other component was that our





agency leadership gave us support to move ahead with the experiment. Carolyn Young, our executive director, gave us permission to open the data almost as soon as we had the idea. We were lucky that our agency has a long history of supporting open source and open data. TriMet's TransitTracker™ (next arrival times) feed was already open, so outside developers were already using TriMet open data prior to 2005. We had had an open source-friendly procurement policy in place for a decade. These factors meant that the TriMet culture was primed to be supportive of this type of initiative, which allowed us to move quickly.

On December 7, 2005—less than five months after our initial conference call—the first version of Google Transit was launched with TriMet data that covered the Portland Metro area (Garg, 2005). The launch received an overwhelmingly positive response. As Google Transit went live for the first time, word first spread across Europe. According to the Google Transit Team, they watched in amazement as the number of hits to the site increased exponentially. By morning, as the US awoke, the counts were reaching staggering numbers, even by Google standards.

The day of the launch, I did numerous interviews with local TV stations, newspapers, and even several radio stations. It seemed we were onto something important—something that people cared about. We knew we needed to get other agencies on board so that this could expand beyond Portland.

Scaling Up

We had held a workshop just before the launch of the Google Transit beta, in an attempt to get other agencies and developers on board with the effort to open and standardize this data. Multiple transit agencies participated—including representatives from Seattle, Chicago, and New York, among others—but many were apprehensive. A common concern was that providing data in the standard open format wouldn't benefit the agency; it would only benefit Google.

However, this resistance turned around as soon as everyone saw the positive public response to the launch announcement. Agencies saw that they could benefit from being involved—not just by getting good publicity for their agency, but also by offering a service that was clearly in demand by the public. Department heads started calling us, asking, "How can we be next?"

To scale up to more cities, it was essential that transit agencies standardize and publish their schedule data so that it could be integrated into third-party apps the same way across jurisdictions. We worked with Google and with several of the interested agencies to develop this standard format, then called the Google Transit Feed Specification (GTFS), based closely off of the first series of data that TriMet had published.

We chose to keep the files in CSV format. We wanted it to be as simple as possible so that agencies could easily edit the data, using any editor. This approach received substantial criticism—it was even called "technically old-fashioned and brittle" (KiZoom, 2006)—but it was important to us to keep the barrier to participation low so that even smaller, less-resourced agencies could join in. As Google Transit team member Joe Hughes put it in his original welcome message on the GTFS discussion list:

"We chose CSV as the basis for the specification because it's easy to view and edit using spreadsheet programs and text editors, which is helpful for smaller agencies. It's also straightforward to generate from most programming languages and databases, which is good for publishers of larger feeds." (Hughes, 2007)

In September 2006, Google Transit launched in five more cities that began publishing their service data in the nascent standard format: Tampa; Honolulu; Eugene, Oregon; Pittsburgh; and Seattle. Shortly thereafter, we published the first version of the GTFS spec under a Creative Commons License ("What is GTFS?" 2012).

Within a year, Google Transit launched with fourteen more transit agencies in the United States and expanded internationally to Japan. As of July 2013, Google Transit has launched in hundreds of cities worldwide ("Google Maps: Transit:

Cities Covered," n.d.). Detailed transit instructions, in addition to driving directions on Google Maps, is available in Africa, Asia, Australia, Europe, North America, and South America.

In early 2007, TriMet and other transit agencies began to publish their transit data openly, in a more formal and publicized way, with official sites for developer resources. TriMet and San Francisco's BART, the Bay Area Rapid Transit, were the first agencies, and others soon followed as the benefits became increasingly apparent ("Developer Resources," 2013; "For Developers," 2013).

TriMet's core business is not software development. By making our data open, we were able to leverage external resources to bring benefits to the public. Making transit data publicly available and collaborating with a community of software developers has resulted in hundreds of useful and popular transit applications for TriMet customers and many others. Many had been developed by third parties offering a wide range of creative and useful tools available on multiple platforms for a variety of users. When I asked Tim McHugh about why he supported opening our data to third-party developers, he explained:

"Due to the large proliferation of transit applications on mobile platforms, the market is able to react quickly to changes and to fill gaps in service. This is something that one government IT department could not develop or support with the same level of spontaneity and flexibility." (McHugh, personal communication, 2013)

One of the first initiatives President Obama introduced was an open government initiative ("About Open Government," n.d.). This resulted in Data.gov, a resource for software developers and a resource for applications in support of open data and open source software. This movement has spread to many cities, states, and countries, bringing many benefits to the public. Having already released open data in transit put us in a good position to respond quickly to the mandate and take advantage of this new momentum from the top.

In addition to online groups, forums, and mailing lists, other sites, like the GTFS Data Exchange (www.gtfs-data-exchange.com), began to emerge to establish communities around the standard and facilitate wide adoption in the industry. Companies that offer support for the production and maintenance for GTFS began to fill an important void in the industry. GTFS began to generate business and business incentives.

Why Standards Matter for Cities

I believe there are several important ingredients that made the GTFS initiative successful:

A collaborative team that started small and designed for a very specific use.

Releasing the transit data specification in an open standard; the simplicity of the specification and format.

A tangible business incentive for the transit agencies and for private partners to participate.

The contributions and involvement from the worldwide community of users.

The biggest advantage of being part of the GTFS standard for agencies is that their information appears in a global set of search products that are easy to use and visited by millions and millions of people every day. People who do not know a city well, are visiting, or are simply unaware of the agency's services, can benefit and find alternatives to driving. Regular public transit riders benefit from being able to find transit information in a familiar user interface and in the context of other useful information. It's about providing better information and service delivery for citizens, which is ultimately aligned with any agency's mission.

This all comes at a low cost for the city. At TriMet, our process is automated, so there is very little overhead. TriMet has four major service changes a year, in addition to minor changes and adjustments in between. We may update and publish our GTFS data as frequently as twice a month. TriMet has not incurred any direct costs for this specific project, except resource time, which is a very small investment in comparison to the returns.

Now that agencies have made GTFS freely available as open data, hundreds of applications have spawned worldwide. We found that by making our data easily and openly accessible, developers are getting very creative and expanding its use. This is not only beneficial because it expands the number of product offerings available, but it can also have emergent economic benefits for developers and the communities they live in. In addition, because the standard allows for interoperability between cities, applications built to serve one city can be readily deployed to serve other

TRIMET

2-Division

Weekday — **To Portland City Center**

Gresham Transit Center Stop ID 2253	SE Division & 156th Stop ID 1408	SE Division & 145th Stop ID 1399	SE Division & 122nd Stop ID 1381	SE Division & 82nd Stop ID 1499	SE Division & Cesar Chavez Blvd Stop ID 1459	SE Division & 12th Stop ID 1376	SW 6th & Taylor Stop ID 7800	NW 6th & Flanders Stop ID 9300
4:08	4:20	4:22	4:27	4:35	4:43	4:50	4:59	5:03
4:33	4:45	4 47	4:52	5:00	5:08	5:15	5:24	5:28
4.58	5:10	5.12	5:17	5:25	5:33	5:40	5:49	5.53
5:16	5:29	5:31	5:37	5:45	5:53	6:00	6:09	6:13
—	—	5:47	5:52	6:00	6:08	6:15	6:24	6:29
5:39	5:52	5:54	6:00	6:08	6:16	6:23	6:32	6:36
—	—	6 03	6:08	6:16	6:24	6:31	6:40	6 45
5 55	6:08	6 10	6:16	6 24	6.32	6.39	6:48	6 52
6.04	6:17	6 19	6:25	6:33	6:42	6:49	6:58	7.02
6:14	6:27	6:29	6:35	6:43	6:52	6:59	7:08	7:12
—	—	6:39	6:44	6:52	7:01	7:09	7:19	7:23
6:31	6:44	6:46	6:53	7:01	7:10	7:18	7:28	7:33
—	—	6 53	6:58	7:06	7:15	7:23	7:33	7 37
6:41	6:54	6.56	7:03	7:11	7:20	7:28	7:38	7.42
6:46	6:59	7:01	7:08	7:16	7:25	7:33	7:43	7:48
—	—	7.08	7:13	7:21	7:30	7:38	7:48	7:52
6:55	7:08	7:10	7:17	7:26	7:35	7:43	7:53	7:58
—	—	7 17	7:22	7 31	7:40	7:48	7:58	8 02
7 04	7:18	7 20	7:27	7.36	7.45	7.53	8:03	8 08
7:09	7:23	7.25	7:32	7:41	7:50	7:58	8:08	8.13
7.17	7:31	7 33	7:40	7.49	7:58	8:06	8:16	8 20
7:25	7:39	7:41	7:48	7:57	8:06	8:14	8:24	8:28

cities for a much lower cost and effort than if the data wasn't standardized.

Early on in the adoption of GTFS, it was suggested that transit agencies charge fees for their GTFS data. However, it became apparent that the return on investment (ROI) was far greater than potential sales on the data. In addition, Public Records requests reminded agencies that making sought -after data openly available was a far better solution than addressing many requests individually. Some developers resorted to screen-scraping the data off transit sites, which was not a stable method that ensured access to current and accurate customer information. It became apparent that open data in a standard format was the solution that was in the best interest of the public.

Lessons Learned for Scalable Standards

Civic data standards are not just limited to the realm of public transit. Data is a central component of every facet of public service, and there is an opportunity for standards in many of them. Emergent efforts include those like Open311, a standard format for civic issue reporting; LIVES, a format for restaurant inspection data; and House Facts, a standard for residential building inspection data. Lessons from our work developing GTFS can help inform how to build a truly scalable and open data standard for cities.

A key to the success of GTFS was that we built around a real use case. We saw a real problem and a way to solve it with data. Because the standard clearly linked to a real-life problem, we were able to articulate a real ROI for adoption. It's important to take the time to think through all the different stakeholders and how they can benefit from participation. Don't underestimate the value of publicity as a tool when pushing to get those first adopters on board. Public agencies are usually accustomed to getting negative media coverage when something goes wrong and no coverage when something goes right. The chance to get positive press for the good work they are doing is often a powerful incentive. It was game changing when TriMet gained national attention at the launch of Google Transit.

Working with a well-known national partner to integrate the data can provide a tremendous amount of the momentum needed to succeed. Working with Google enabled us to show scalable value quickly, as well as gain attention from the association with their brand. We could immediately show national, and even worldwide, relevance through integration with Google's existing widely used products.

However, it's important not to conflate the identity of an open standard with the brand of a corporate partner. While we engaged other open source developers to build apps on the standard and created partnerships with industry vendors who supplied transit data services to provide standards-compliant export functionality for their customers, we received pushback. Agencies didn't want to be perceived as giving their data to Google exclusively, and developers were reluctant to develop off of a standard that had Google in the name. We eventually changed the name from Google Transit Feed Specification to General Transit Feed Specification—and the effect was transformative. It greatly reduced resistance from software vendors; proponents of existing transit data standards; companies that assembled and resold public data; and transit agencies who were worried about losing control of their data.

In addition to a national partner, the involvement of other developers and partners (including civic hackers, other cities, and larger vendors) is crucial for scalability and neutrality of the standard. Be agile and evolve to support other entities and applications.

It's amazing that GTFS has since been adopted relatively quickly on a worldwide platform, but it's even more amazing to think it has been adopted worldwide voluntarily. Apparent and persuasive ROIs, its unpretentious and evolving nature, and its supporting community are all key growth factors.

Standards for Better Public Service

Why did we do all this? I believe it comes back to the core meaning of the term "public service." It is about providing the best experience possible to our citizens. At TriMet, we believe it should be just as easy for our customers to plan transit trips as it is to get driving instructions. Opening up this data to allow for wider use and integration with existing services is putting a new face on public transportation and reaching a much wider audience than we as a single local agency could ever hope to. Contrary to speculation that third-party transit applications are drawing attention away from transit agencies and their brand, TriMet is finding that many applications are reaching a broader audience. They direct potential customers to more comprehensive information on an agency's site that may otherwise be unknown.

We still offer our own TriMet trip planner, as we feel it is our responsibility to provide that service to our customers, but Google Transit, Bing Maps, and all the other apps that developers have built using this data, offer our customers another way to plan their trips with different options and features. GTFS lets us meets citizens where they already are and builds interoperability across municipalities as it expands to more cities.

The next logical step after GTFS was developing a specification for real-time transit data in addition to schedule data. TriMet, MBTA, BART, and MTS worked with Google on a new specification for real-time transit data, not just scheduled: the General Transit Feed Specification-realtime or GTFS-RT ("What is GTFS-realtime?" 2012). This information is very beneficial to our customers, and wide adoption is growing. We look forward to seeing the impact of civic data standards as they expand to other areas of transit and public service.

As Chris Harrelson has said: *It's perhaps easy to jump to the conclusion that Google is the hero in this story, in the typical role of the innovator who overcomes the inefficiencies of the past, but this is really not true in this case. This is a success story about a new model of cooperation in order to solve a problem that cannot be addressed directly with either market forces or a classic government solution. Everyone had an equally important role to play, and without TriMet and other government advocates, this story would not be possible."* (Harrelson, personal communication, 2013)

GTFS began with a single public agency and single private company working together to solve a common problem creatively. The extensive community of agencies and GTFS users continue to collaborate on evolving the standard to meet the requirements of many more applications. The end result is that it is now just as easy to get transit directions as it is to get driving directions from nearly anywhere in the world.

About the Author

Bibiana McHugh has worked in TriMet's Information Technology Department since 1997 and currently leads a team of innovative web developers and analysts as the IT Manager of Geographic Information Systems and Location-Based Services. She leads several open data and open source software initiatives including opentripplanner.org, maps.trimet.org, rtp.trimet.org, developer.trimet.org, and trimet.org/apps. After initiating collaboration with Google for the first release of Google Transit, she helped pioneer the now worldwide standard General Transit Feed Spec (GTFS). She received a degree in Geography from the University of Kansas.

References

Bay Area Rapid Transit. (2013). For Developers. Retrieved from http://www.bart.gov/schedules/developers/index.aspx

Faludi, J. (2005, June 5). A Call for Open-Source Public Transit Mapping. Retrieved from http://www.worldchanging.com/archives/002937.html

Garg, A. (2005, December 7). Public transit via Google. Retrieved from http://googleblog.blogspot.com/2005/12/public-transit-via-google.html

Google Developers. (2012, January 12). What is GTFS? Retrieved from https://developers.google.com/transit/gtfs/

Google Developers. (2012, July 26). What is GTFS-realtime? Retrieved from https://developers.google.com/transit/gtfs-realtime/

Google Maps. (2013). Transit: Cities Covered. Retrieved from http://www.google.com/landing/transit/cities/index.html

Hughes, J. (2007, May 18). General Transit Feed Spec Changes (Msg. 1). Message posted to https://groups.google.com/forum/#!msg/gtfs-changes/C5dgsKGkpDA/kyxN1DCS-dQJ

KiZoom. (2006). The Google Transit Feed Specification — Capabilities & Limitations: A Short Analysis.

The White House. (n.d.). About Open Government. Retrieved from http://www.whitehouse.gov/open/about

TriMet. (2013). App Center: Transit Tools for the Web and Mobile Devices. Retrieved from http://trimet.org/apps/

TriMet. (2013). Developer Resources. Retrieved from http://developer.trimet.org/

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The Paradox of Efficiency

An extract from **JAMES GLEICK'S** 1999 *book "Faster"*

AT DAYBREAK ON A Wednesday in March, a McDonnell Douglas Super 80, No. 241 in the American Airlines fleet, takes off from Phoenix for Dallas Fort Worth. A quick stop, and the plane continues to Richmond, Virginia, and then to Norfolk, and then back to Dallas.

A generation ago, when airline scheduling was performed on big sheets of paper by men wearing green eye shades, that would already have been an unusual combination of cities for a single plane in a single day. An airplane flying from Phoenix to Dallas would most likely have returned directly to Phoenix.

1. But the trek of No. 241, now back at the Dallas hub for the second time that day, turns more bizarre with a northward excursion to Calgary, Canada.
2. The next day, the jet returns to Dallas before flying to Los Angeles and then back east to Austin.
3. The next day: Austin to San Jose to Dallas to Nashville to Chicago to Denver.
4. Denver to Chicago to Boston to Chicago to Tampa.
5. Tampa to Chicago to Dallas to Chicago to Dallas to Des Moines.
6. Des Moines to Dallas, and now, nearby, as the staff of American's cavernous System Operations Control Center converse softly before large-screen workstations and eat takeout lunches at their desks, the computers show No. 241 in the air, en route to yet another city, San Diego, its fifteenth destination that week.

Its ramblings are not random; they are precisely charted by computers. The goal is a schedule of maximal efficiency the best, or near-best, of the quadrillions of possible solutions. Scott Nason, the airline's chief information officer, tracing the past and future peregrination of this one aircraft on his console, guesses that the pattern of destinations and layovers has grown so tangled and involved that it will never repeat itself. All this complexity has a purpose: the saving of minutes. *Presumably the minutes add up. Nason says, Some of the minutes are very important."*

He walks across the darkened command centre, where all of American's division chiefs will gather at computer stations. In the event of a crisis— strike, war, hurricane. Through the window that makes up one side of the room, he looks out over the much larger control room below. "*We can lock the doors and from here we can run the airline",* he says. The big room is most fundamentally a computer room too - those human beings, with takeout lunches next to their keyboards, are mostly there to monitor a vast calculation machine tying together data streams not just from every ticket counter and every airport gate but direct from electronic sensors in the doors, wheels, and brakes of every jetliner. The networking of the modern world finds expression here: the free-flowing connections between devices, calculating machines, display screens, and human overseers control virtually everything that needs to be controlled.

The sensors have four basic messages to send:

1. Out (from the gate);
2. Off (the runway);
3. On;
4. In

and, right now Frank Botti, who is running the centre from a many-screen console, is thinking about the "pineapple DC-10" that should have been Out and Off for Honolulu three hours earlier. He can assume that would-be vacationers are boiling with frustration on the ground in Chicago, where the jet is sitting with an engine failure. Botti barely glances at his maps, his flight list, more maps, and the giant floor-standing display of National Lightning Detection. In a less efficient era, the waste of simple back-and-forth scheduling might have meant an extra aircraft or two just waiting idly, costing the airline money, but luckily available to fill in for the out-of-service DC-10. Now, with scheduling approaching perfection, less than 2 percent of American's fleet lies fallow at any given moment. So the nearest replacement plane happens to be in Dallas. A crew must fly it to Chicago. And another crew-scheduling problem is developing as the minutes tick by. The pilots have been sitting for quite a while. This time counts as time on duty, and now the long flight to Hawaii would push them over the legal maximum. So another crew must be found to replace them. Those vacationers will wait longer, and they will never know exactly why.

This is the paradox of efficiency.

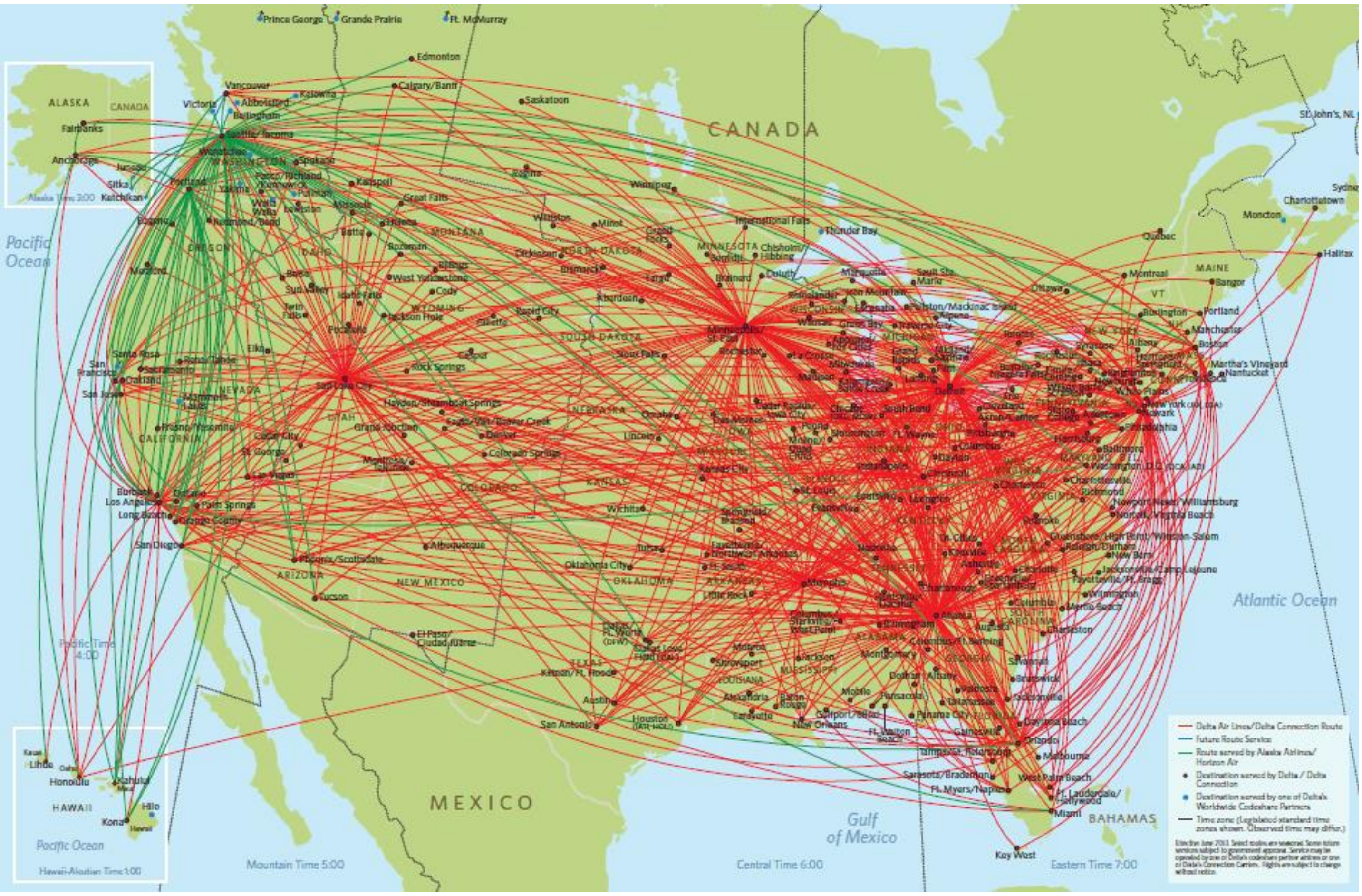
Air travel, like other intricate modern institutions, is a web of time and motion. Running parallel to the

scheduling of aircraft runs a separate set of schedules for pilots and flight attendants, even more complex, determined by a mix of human and regulatory requirements. Alongside that, the computers continually recalculate aircraft weight and balance. Alongside that, they attempt to find increasingly efficient routing, using a real-time winds-aloft database in four dimensions: latitude, longitude, altitude, and time. They attempt to blend these facts of weather, chaotic yet pure, with muddier necessities: avoiding restricted military airspace; ensuring that a safe landing spot is always within reach, even on a single engine; negotiating with Federal Aviation Administration controllers over their preferred routes.

With no other complications, the variation in winds aloft would be enough to destroy the possibility of precision in the most important statistic for each flight in the schedule: its "*block time*" gate to gate — flying time plus ground time. Block times are published and reported to regulatory authorities to the nearest minute. They are largely a fiction. On any given day the prevailing winds cause far more deviation in flight times than could any refinement in engine design or airfoil surfaces. A fast Jetstream during a transcontinental flight can add or subtract an hour. Even at the perfect airline- an airline where arrival gates were always ready, where baggage-handlers never faltered, where flights were never overbooked precise block times would be an impossibility. The reality of flying times is a fuzzy collection of probabilities — a statistical spread. Perhaps a flight would take 90 minutes a quarter of the time, 100 minutes another quarter of the time, 110 minutes another quarter of the time. What block time should a scheduler announce to the public? Corporate considerations further cloud the issue. In the seventies and eighties, airlines deliberately distorted these numbers by publishing unrealistically short block times. Then in the nineties, industry deregulation led to far less competition on most routes, so airlines began publishing unrealistically long block times to improve their on-time performance records. They could even adjust the numbers so as to trade on-time performance in a less critical market for on-time performance in a market where competition was especially fierce. If an airline's on-time performance lagged in one fiscal quarter, easing the block times could help in the next.

These distortions aside, the airlines have truly succeeded in getting faster.

As elsewhere in the delicate texture of modern life, time-saving has come more from the tautening net of efficiency than from raw speed. Airplanes themselves are not really speeding up anymore. The first commercial supersonic airliner, the Concorde, with its drooping needle nose and elegant delta wing, first carried passengers in 1976, cutting the New York to Paris time by half. British Airways had estimated that four hundred Concordes would be sold by 1980- what a boon to business that would be! *"We are now near the time when again we cut our traveling time in half,"* predicted Nation's Business in 1969. *"The vehicle will be the supersonic transport the SST and the main beneficiary will be the American businessman. Legions oppose the SST on grounds it is too costly, too noisy, too complicated, too limited in*



usage. The Wright brothers heard those charges too, but then went ahead ...." Seers imagined the next step forward rocket planes arching through demi-orbit from Tokyo to New York.

But these anticipatory paeans to the supersonic transport marked an ending, not a beginning. A quarter century later, just thirteen aging Concordes remained in service with Air France and British Airways. An American supersonic transport project was long since cancelled and forgotten, and the Russian Tupolev was grounded. Partly to blame, were the environmental curses of these planes — scarring of the ozone layer and unlikable noise twelve miles below their flight path. Routes were limited to the transatlantic run. The Concorde could not fly cross-country because of noise, and it lacked the fuel capacity to cross the Pacific. Perhaps most damning, though, was a variation on the Law of Diminishing Returns. There are diminishing returns in time-saving. The minutes saved blasting through the rarefied air of sixty thousand feet were so easily lost at the tollbooths of the Queens- Midtown Tunnel, lost again in the perpetual traffic jam on the Van Wyck Expressway, and lost again in the waiting line for customs clearance. (And every source of delay could be another business opportunity: IBM's vision of the future is its "Fastgate" system, which promises to cut your wait at immigration checkpoints to fifteen seconds. All you have to do in return for this saving is submit your "biometrics" fingerprints and voiceprints and other personal data for use in a state-of-the-art security database.) Airline marketing planners had actually imagined that business executives would fly from New York to London for lunch and back again that afternoon. Four airport taxi rides in a single day? Meanwhile, overseas telephone calls and e-mail and virtual conferencing became cheap and easy real-time communication enough. Supersonic travel never found enough time-hungry travellers to become profitable. Space agencies and aircraft manufacturers kept higher-tech plans on their drawing boards, tempted by new materials and technologies, but the innovative commercial aircraft of the nineties were mostly commuter planes, slow, often with propellers, extending the web of service to small, out-of-the-way destinations.

So - clean the planes faster; board by row numbers; deploy electronic ticket readers to help sort out the last-second seat-assignment conflicts that plague overbooked flights. Push the FAA toward a new system of Free Flight, in which aircraft could vary their paths to take advantage of the vicissitudes of winds and traffic, instead of following archaic routes based on the ground locations of old-style radio beacons. These are the time-saying efficiencies that matter now. In their own ways, time-hungry fliers try to maximize their own efficiency by becoming masters of the details. The most experienced travellers trade information about which airline terminals come first when you enter Kennedy International Airport by highway and which is nearest the heliport; which times of day and which days of the week have the most congestion; which gates are nearest the baggage claim area. They learn the

euphemistic meanings of terms like "direct", when applied to flight schedules, means those with extra stops. They learn to sit near the front of the plane so that they can be among the first off; above all they want to avoid the honour of the oblivious slow-moving passenger who blocks the lone aisle, trapping a planeload of time-aware travellers. Of course they never check baggage if they can help it. Their obsession with time may or may not mean that they race to the gate at the last minute.

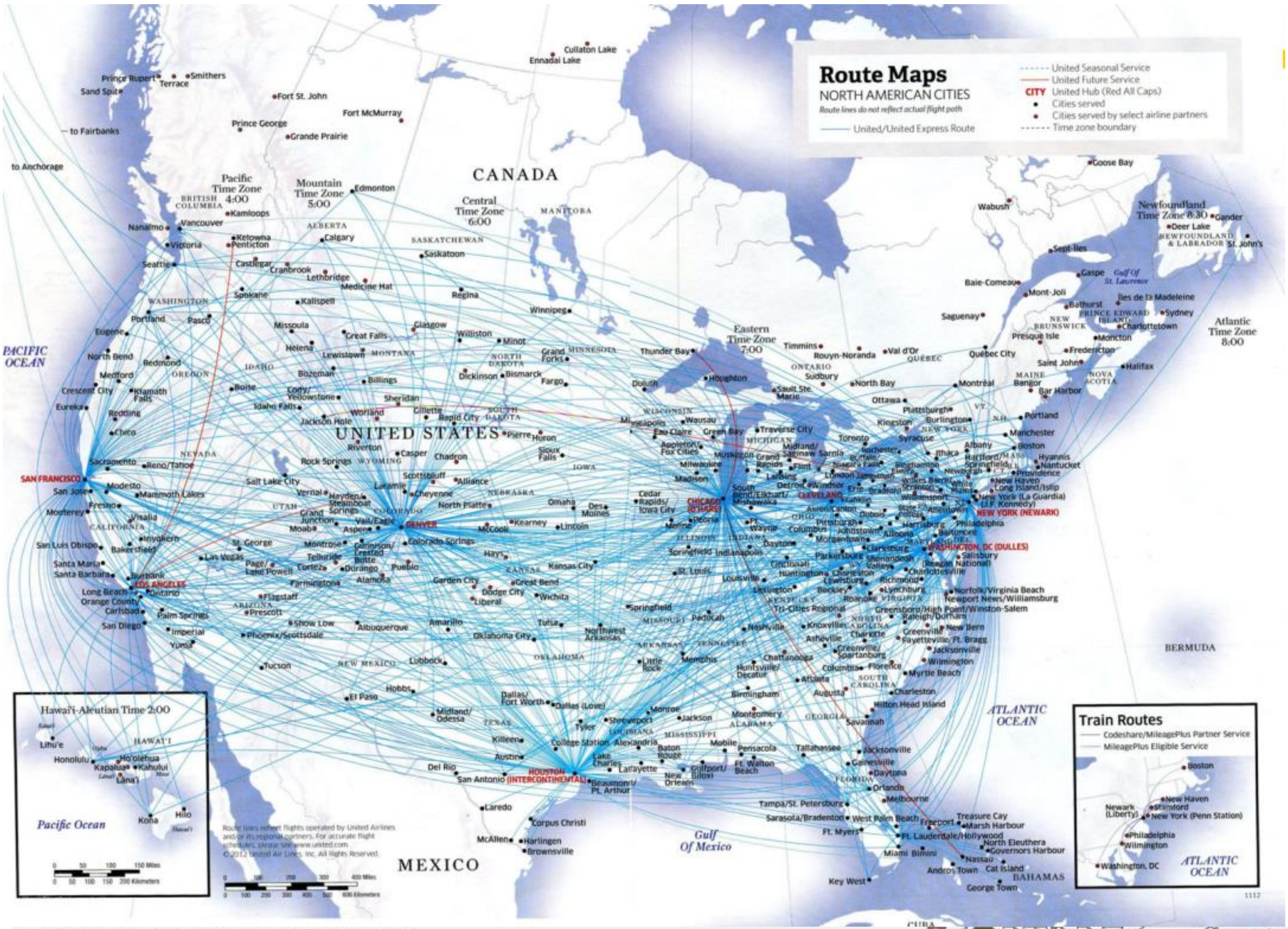
Some cannot stand the risk and pressure; others cannot stand the waste of sitting unnecessarily in an airport lounge, even with laptop and cell phone. Scott Nason has a strong preference for arriving early. He still remembers when he called down to make sure the 1:06 flight to Boston was on time and was told: "*There is no 1:06. Flight 106 leaves at 12:54.*" He just got to the gate at 12:54 — sweating.

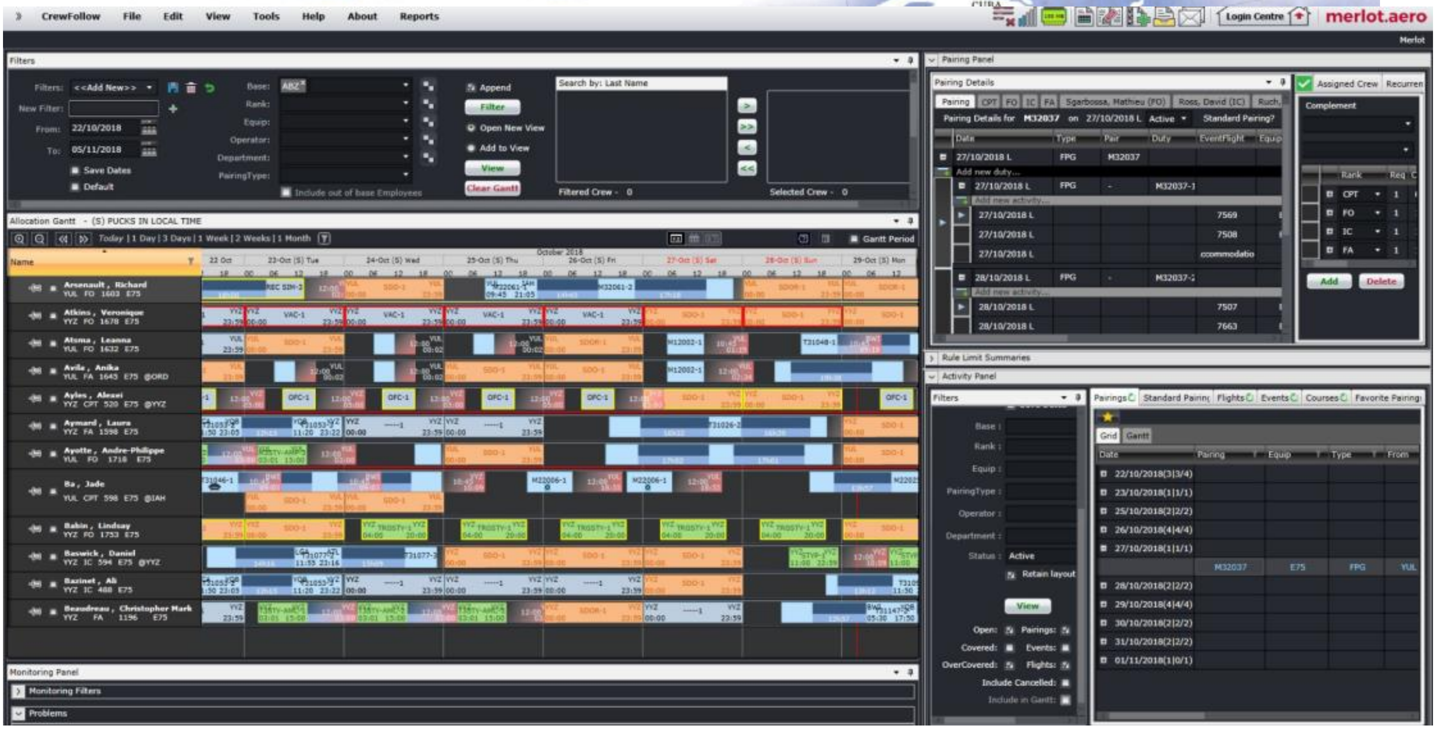
The paradox of efficiency means that as the web tightens it grows more vulnerable to small disturbances, disruptions and delays that can cascade through the system for days. For example: American Flight 1128, inbound from Mexico, is now forty-four minutes late, and the computers are deciding whether to delay some of the connecting flights those passengers will be racing toward. This, too, will be a real-time decision based on complex modelling. The computer will know how many people are how many minutes late for each flight. It will consider the distance to the gate, the time before the next available flight to the same city, the likelihood of new delays at the other end... It will consider the passengers, too—if they have paid for first-class tickets, they will be more likely to find the gate waiting open for them. Pilots often accuse Nason and his computers of being overly fixated on time. "*They ask, how can you close the door on a passenger running from three gates down?*", says Nason. *"Well, there are 130 people on this airplane looking at their watches."*

It happens that Flight 1128 left Mexico late for reasons of "crew legality." The night before, its flight attendants, the only ones available, were twenty-seven minutes late leaving Miami and then forty-one minutes late arriving in Mexico. That delay cut into their legally mandated overnight rest period. So this morning, the Dallas-bound flight could not depart until the precise minute when their rest period expired.

Networks like this are said to be tightly coupled. A complex construction project with a timeline scheduled with perfect efficiency all the slack squeezed out of it, may be tightly coupled and a candidate for serious disruption. In the most extreme case, everything depends on everything else. Vibrations anywhere can be felt everywhere. The shin bone connected to the knee bone: that is tight coupling in the engineer's sense, especially if the ligaments do not allow too much flex. Charles Perrow, in his study Normal Accidents, extended the concept to complex systems where the coupling connects not physical parts but abstract services, people, and organizations. "*Loosely coupled systems, whether for good or ill, can incorporate shocks and failures and pressures for change without destabilization,*", he notes. "*Tightly coupled systems will respond more quickly to these perturbations, but the response may be disastrous".* In tightly coupled systems, the connective tissue is often time itself. Process B in a drug company production line or an aircraft-assembly plant or even a trade-school education must follow Process A as tightly as a ratchet and pawl. Waiting time or stand-by time can mean flexibility or safety. A tight system squeezes it out.

"*Effects do cascade*", Nason acknowledges. "*We try to build in enough slack to break the cascades.*





We try to watch for cascades and truncate them. But some things you can't avoid". The hub-and-spoke system, itself a paragon of efficiency, with flights tightly scheduled in and out of a central focal point like Dallas, creates a particularly centralized site of vulnerability: a storm at the hub will cause delays nationwide. The system evolved because of welcome interactions between flights. The flights into and out of the hub support one another. Before hubs and before computers, there could never have been a regular flight from Shreveport

Aegean Airlines

Fri ,16 Jan 2015

PERSONAL CREW SCHEDULE FROM 01/08/2014 TO 31/08/2014

All times in UTC, Scheduled, showing flight departure/arrival times

NAME : FENART Pierre
ID : 20247 (HER FO-321,320,319)

Aug01 Fri	Aug02 Sat	Aug03 Sun	Aug04 Mon	Aug05 Tue	Aug06 Wed	Aug07 Thu	Aug08 Fri	Aug09 Sat	Aug10 Sun	Aug11 Mon	Aug12 Tue	Aug13 Wed	Aug14 Thu
KIN 01:15 4205 02:15 KIN HER 06:20	476 04:05 HER MJC 07:00 477 07:45 MJC HER 10:30	412 03:45 HER MRS 06:50 413 07:35 MRS HER 10:20	OFF	RLV	RLV	4264 11:40 HER TLV 13:20 4265 14:20 TLV HER 16:05	XSBY 06:00 18:00	988 05:50 HER LED 09:55 989 10:45 LED HER 14:50	SB 04:00 16:00	462 11:30 HER CDG 15:00 463 15:50 CDG HER 19:05	OFF	OFF	OFF

Aug15 Fri	Aug16 Sat	Aug17 Sun	Aug18 Mon	Aug19 Tue	Aug20 Wed	Aug21 Thu	Aug22 Fri	Aug23 Sat	Aug24 Sun	Aug25 Mon	Aug26 Tue	Aug We
4288 11:30 HER LNZ 14:10 4289 14:55 LNZ GRZ 15:25 4289 16:10 GRZ HER 18:40	4260 21:30 HER TLV 23:10	4261 04:00 TLV HER 05:45	OFF	4250 06:00 HER EXT 10:00 4251 10:45 EXT HER 14:45	4252 05:30 HER TSR 07:15 4253 07:55 TSR HER 09:35 4256 10:15 HER CLJ 12:15 4257 13:00 CLJ HER 14:45	442 06:30 HER TLV 08:10 443 09:00 TLV HER 10:45	986 06:00 HER DME 09:55 987 10:45 DME HER 14:35	RDO	SBA 11:00 20:00	4224 11:00 HER TLV 12:40 4225 13:30 TLV HER 15:10	SB 05:00 17:00	47 11: HE BR 15: 47 16: BR HE 19:

CODE EXPLANATIONS

CODE	DESCRIPTION
OFF	Day off
RLV	Requested Annual Leave
XSBY	Special ex Canceled Flight
SB	Home standby
RDO	Requested Day Off
SBA	Home standby afternoon

TOTALS

Block Hours	91:18
FLIGHT DAYS	17

to Portland or from Shreveport to Tokyo, yet now marginal cities like Shreveport join the network because these interactions add up to make the connections economically feasible: the Shreveport-Dallas flight strengthens the Dallas-Portland and Dallas-Tokyo flights. These same interactions, though, can send calamity racing across the system.

It all seems out of control or rather, in control and yet out of reach, for us humans. In countless small ways, we seek to smooth the inefficient edges in our own lives. We have learned to keep efficiency in mind as a goal, which means that we drive ourselves hard. Lost ground can be regained lost time never, said Franklin D. Roosevelt in 1942, exhorting the nation to faster and more efficient weapons production, and he added, "*Slowness has never been an American characteristic.*" A magazine advertisement running that year boasted that air transport *"not only saves, but also gains, days and weeks of precious time and helps relieve the greatest shortage of all TIME itself"*. Taylorism, of course, had triumphed. Still, at mid-century, a typical business would keep on a few over-the-hill workers in harmless non-jobs; would overlook an occasional late-afternoon card game in the office; would tolerate the routine two- or three-martini lunch. Not anymore. All these inefficiencies represented slack that could be pulled in for a crisis, just like an extra DC-3 idling at O'Hare. We eliminate slack now. Ready access to information makes it easy. Six terabytes of data swim about in American's computer system at any given moment. When flights are cancelled, the decision maker is a workstation over in one corner, now called the ***"Cancellator"***, formerly known as the ***"Hub Slasher"***. There is no going back. The problems are too complicated. Everything would have to slow down.

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Respond to this story

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Tanya's Quiz #1

1. On what line in Australia would you have found the 3-word station of Cold and Wet that was opened in early 1910? It was renamed Martiupp in March 1910, renamed (again) Yonga in 1912 and renamed (yet again) Bornholm during 1914. Bornholm closed on 30th September 1957, along with the line. [Hint: despite the non- standard spelling, there's a very good clue in one of the names.]
2. Three closed suburban rail termini in Australia and two closed Australian electric tram termini share the same name. What is that name and in which cities were they located? [Hint: there is a closed non-electrified suburban station of that name across the Ditch in Wellington.]
3. The name 'Upfield' was a VR invention – why was a name such as this necessary?
4. At what four consecutive stations on Melbourne's Glen Waverley line did suburban electric trains terminate over the years?
5. Why did VR's out of use kerosene fired Chelmsford steam buses operate along most of the St. Kilda to Brighton Beach electric street railway route from 9th March 1907 until 16th March 1907?
6. What suburban rail journey can be made in both Perth and Sydney? (Opposite directions count as the same journey.)

Rhetorical question:- Why would Nevertire require sleeping berth tickets???
Answers to Tanya's Quiz #1 will appear with Quiz #2

SIX DAYS IN THE AIR WITH #241