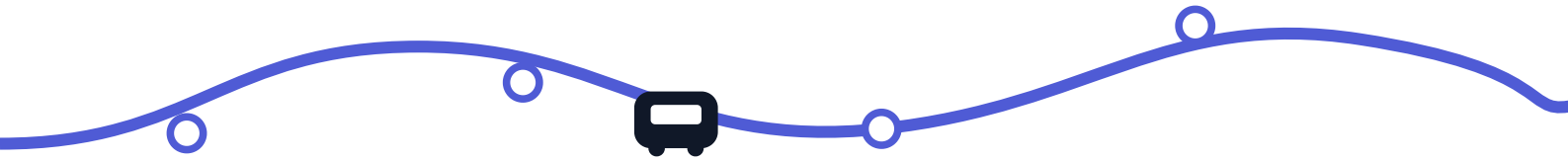
MALAYSIA TRANSIT

WHITE PAPER · NOVEMBER 2026

Live arrival times and punctuality

How Malaysia Transit works them out from every bus's GPS, what changed on 21 November 2026, and how well they work, service by service.



53%

of live times within 2 minutes of the bus, up from 32%

92%

within 2 minutes when the bus is under 3 minutes away, up from 45%

92%

of recorded stop times within 30 seconds of the bus's own GPS track

AT A GLANCE

Live times from GPS, punctuality from records

Malaysia Transit shows live bus arrival times for 13 bus services across Malaysia and, since 21 November 2026, records every bus with a live GPS feed to say how buses kept to their times. This paper explains exactly how both are worked out and how well they work, with every measurement behind them.

53%
of live times within 2 minutes of when the bus really came
was 32% · 11 services, same buses, same moments

4.9 min
average miss, all distances
was 7.3 minutes

1.2%
of minute-to-minute updates jump 5 minutes or more
was 4.6%; MRT feeders 14.6% → 0.6%

92%
of recorded stop times within 30 seconds of the GPS track
2,166 stop times, 10 services

In five points

- **Live times come from the bus itself.** Each bus is placed on its route line, the distance left to the stop is measured along that line, and it is timed at the pace the service's buses are making right now, plus a short stop at each stop on the way. No rush-hour guesses, fixed speeds or timetable minutes.
- **They are closer and steadier.** Run on the same buses at the same moments, times within 2 minutes went from 32% to 53%, and from 45% to 92% when the bus was under 3 minutes away. Times that jump went from 4.6% of updates to 1.2%.
- **Buses waiting at the start say so.** "Not departed yet", with the departure time where the service keeps to it: in Kota Bharu such times within 2 minutes went from 12% to 54%.
- **Punctuality is measured, not assumed.** Every bus is recorded every 30 seconds; on time means 1 minute early to 5 minutes late against the bus's own timetabled time. Kuching's buses are read against their route's nearest departure, Rapid KL's against when they usually come.
- **Rapid KL's timetable mostly doesn't hold.** On 22 November 2026 only 202 of its 494 departures left within 30 minutes of any timetabled departure, so its buses are compared with their own usual times instead.

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PART 1

Live arrival times

A live time answers one question: how many minutes until this bus reaches my stop? Since 21 November 2026 the answer comes from the bus's own position and the pace buses are really making, not from the timetable.

1 The data

Every bus service on Malaysia Transit with live positions publishes them through **data.gov.my's GTFS Realtime** feeds (CC BY 4.0): Rapid KL's buses, the MRT feeder buses, Rapid Penang, and BAS.MY in Kota Bharu, Kangar, Alor Setar, Kuala Terengganu, Ipoh, Melaka, Johor Bahru, Seremban (two operators) and Kuching. Each bus's position comes about every 30 seconds, with the trip it is running. BAS.MY Kuantan has no live positions, so only its timetable is shown.

Each operator's **GTFS** timetable gives the routes, their stops, the line each trip follows and the timetabled times. Most feeds leave out how far along the line each stop is (`shape_dist_traveled`): Rapid KL and BAS.MY Kota Bharu, Ipoh, Alor Setar, Kuching and Seremban do, so the server works it out from the line itself.

2 How a live time is worked out

For each bus coming to a stop, every time someone asks, the server takes five steps.

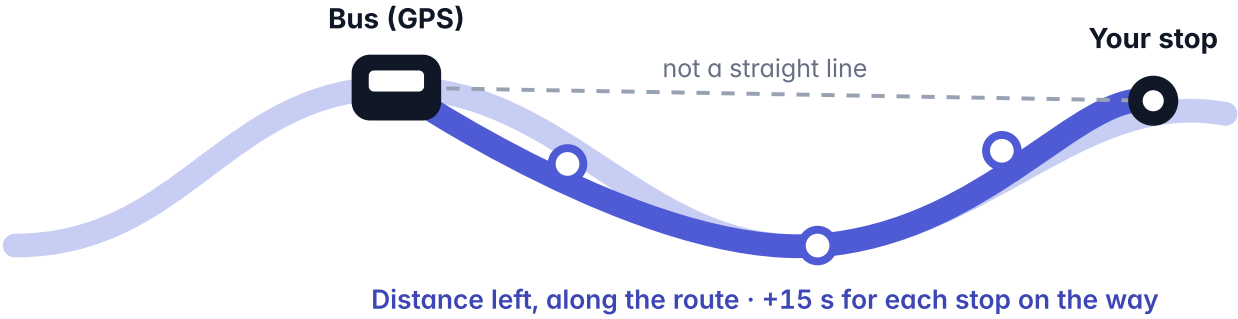


Figure 1. The distance left is measured along the trip's line from where the bus is placed on it to the stop, each stop on the way adding a short stop.

1 The distance left, along the route

The bus is placed on its trip's route line, and so is each stop, in the order the trip calls at them, so a loop's repeated streets go to the right call. The bus is projected onto the line's segments, not just its points, so a sparse line with one point per stop still places it between two stops. The distance is measured along the line: a bus across a river, or on the far side of a loop, isn't counted as close. Only with no line at all does it fall back to the straight line × 1.4.

2 The pace buses are making now

For each service the server keeps every bus's last 8 minutes of positions, fed by every fresh feed, and takes the median of the moving buses' average speeds, from at least 4 buses (their last 15 minutes in a quiet area). The bus's own 8-minute average counts for 30% when it has one. That pace already holds the traffic, the lights and the time of day, so nothing is added for rush hour. A drop in it counts once it has lasted (the median of the last 15 minutes' paces); a rise, at once (section 3). Until enough buses have been seen (just after a restart, early morning), it starts from the service's typical pace, measured (section 3).

3 Driving between stops, and stopping

The average contains the time buses stand at stops and lights, so between stops they drive at 1.5 times it, kept between 12 and 60 km/h, and each stop between the bus and the rider's adds 15 seconds, counted on the line. Measured, the pace buses really made was 0.74 times the 8-minute average with under 1 km to go, 1.2 times it with 2 to 12 km, and 1.6 times it beyond: driving faster, plus time at each stop, follows that.

4 Less the time since the bus reported

A moving bus has carried on since its position was sent, so the age of that report is taken off, up to 3 minutes.

5 Steady from one update to the next

The server remembers where each bus was on its line, so a move it couldn't have made is held, and the minutes can't swing from one update to the next (section 4). The result is rounded to the nearest minute; under a minute shows as "Now".

What isn't used

No rush-hour factor (the live pace already contains traffic and the time of day; on a weekday's rush a factor didn't help either, section 8), no timetable minutes per stop, no stationary hold, and not the feeds' own speed: every BAS.MY feed reports 0, and one reading says little about the next 10 km. Trains use their average as it is, between 15 and 90 km/h.

3 The pace, service by service

A service gets its own pace scale and stop time only where they beat the shared ones clearly on data they weren't fitted to (fitted on the first half of the evening by time, checked on the second). Three did.

SERVICE	PACE BETWEEN STOPS	EACH STOP	WHY
All others (shared)	1.5 × average	15 s	Johor Bahru, Melaka, Seremban and Rapid KL did better on the shared values; Kota Bharu and Alor Setar gained under 0.2 minutes
BAS.MY Ipoh	1.3 × average	15 s	Its buses run nearer their average
BAS.MY Kuching	2.1 × average	50 s	Its buses stand longer at stops
MRT feeder	2.1 × average	30 s	Quick between stops
Trains	average as it is	none	15 to 90 km/h; no measurements to split it by

Kangar and Kuala Terengganu, measured after, keep the shared values: their own fits did 0.1 minute better and worse on the data held back.

Typical pace

Each service's average pace, stops included, minute by minute as the server measures it (Saturday 21 November 2026, 16:20 to 18:20). The server starts from these until it has measured the pace live.

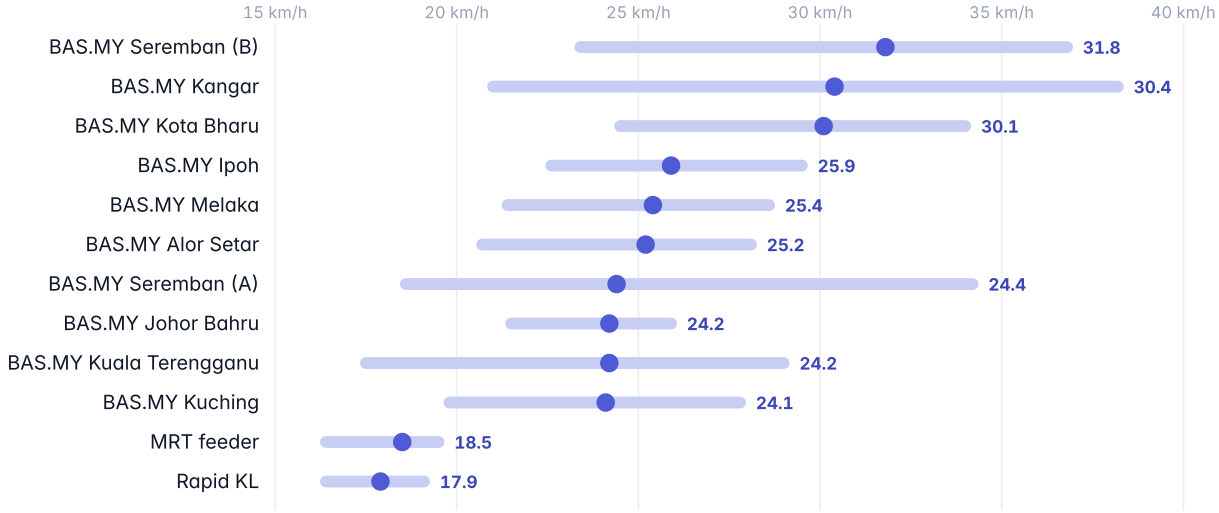


Figure 2. Typical pace: the median minute, with the range of 80% of minutes.

Fixed on Monday 23 November 2026: the pace on the hour

Where a service's buses leave together on the hour, the measured pace dipped as each hour came round: for a few minutes most of the moving buses were the ones just coming in to their terminals, crawling the last stretch. Kuala Terengganu's fell from about 60 to 12-16 km/h for 5 to 10 minutes, and every time on the way doubled, then jumped back. A real slowdown lasts; that dip doesn't. So a drop in the pace now counts once it has lasted: the pace used is the higher of the pace now and the median of those measured over the last 15 minutes, and a rise counts at once. Replayed on the same buses, within 2 minutes: Kuala Terengganu's first hour 21% → 40% (mean miss 7.9 → 4.2 minutes), Alor Setar's 48% → 53%, Kota Bharu's 29% → 33%, Johor Bahru from 06:00 to 07:00 63% → 65%; on Sunday's log, which it wasn't designed on, no service did worse in any window. Kuala Terengganu's updates that jump 5 minutes or more went from 10.5% to none from 06:00 to 07:00. It cost Rapid KL's first hour two points (60% → 58%), and Alor Setar's buses waiting at the start from 07:00 three (36% → 33%).

4 Steady minutes

Replayed minute by minute on the buses logged on 21 November 2026, the first version of the model still let times jump: 1 update in 20 by 5 minutes or more, and on the MRT feeders 1 in 7 (34 minutes, then 4, then 21). In over half of those the bus had moved under 500 m but was put on another pass of its line: a feeder that goes out and back on the same road, a loop that crosses itself. Others were GPS positions a kilometre off for one report.

- **Where the bus was.** Of the places on the line about as close to the bus, the server takes the one nearest where the bus was that the bus could have got to, so a road the route takes twice keeps the bus on the pass it's on.
- **Moves it couldn't make.** Back more than 150 m, or ahead faster than 90 km/h: held where it was for up to two reports, then believed where the line is nearest the bus, and its time with it.
- **How far a time may move.** From one report to the next, later by at most 12% of the minutes left (at least 1), sooner by at most 20% (at least 1.5), as much again for each further minute between reports. A time still beyond that on the third report in a row is believed. Within 3 minutes it's shown as worked out.

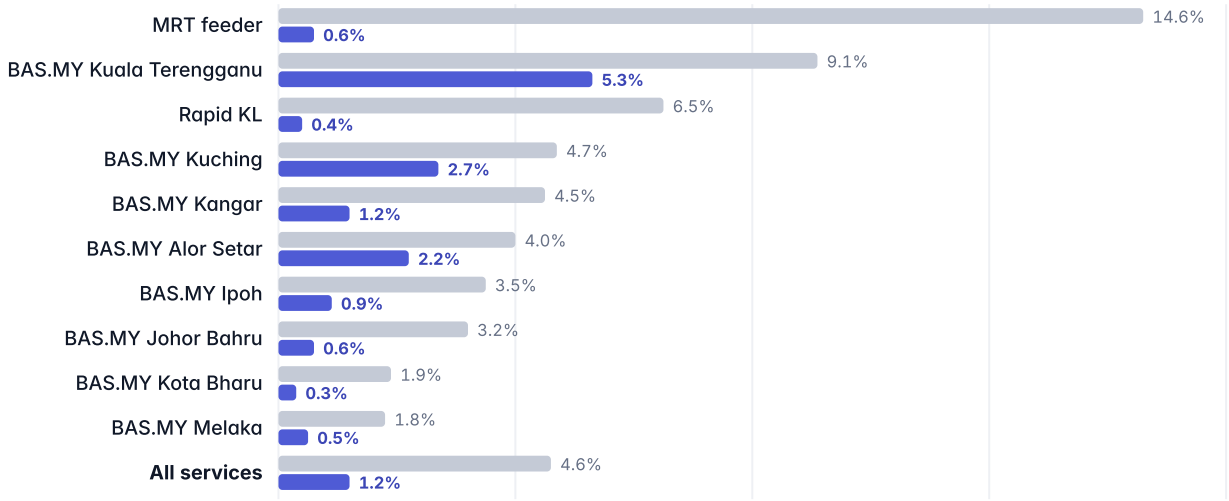


Figure 3. Updates that moved 5 minutes or more off a steady countdown, before and after (the same buses replayed).

Fixed on Sunday 22 November 2026

The first version could stay wrong: a time could only move a minute or so later per report, so a bus found to be much further away kept counting down (a Rapid KL U2538 bus 11 km from its stop showed "1 min" for 50 minutes), and a bus put on the wrong pass of a road was kept there. Now a time still beyond the limits on the third report is believed, as a move is. Replayed on the same buses: all on their way within 2 minutes 51% → 52% (mean miss 5.4 → 5.3 minutes), Rapid KL 52% → 53%, the MRT feeders 55% → 63%.

5 Buses waiting at the start

About a quarter of the live buses logged were standing at their trip's first stop, and the old time counted down from the drive alone while they stood there. Now a bus is **waiting** when it is within 100 m of its first stop (or parked, within 40 m of one place for 90 s, within 400 m of it: terminals are bigger than a pole), not pulling away (under 8 km/h, or its reports not moving apart), and no more than 300 m along its trip. It shows **"Not departed yet"**. What else it gets depends on how its service's buses keep to their timetabled departure:

SERVICE	SEEN SETTING OFF	MEDIAN	WITHIN 3 MIN	DEPARTURE TIME
BAS.MY Kota Bharu	48	+0.8 min	88%	shown
BAS.MY Kangar	18	−0.8 min	83%	shown
MRT feeder	294	+1.2 min	82%	shown
BAS.MY Melaka	60	+1.4 min	82%	shown
BAS.MY Johor Bahru	146	+1.4 min	71%	shown
BAS.MY Seremban	6	+3.3 min	50%	shown
BAS.MY Ipoh	37	+2.4 min	59%	counted from, not shown
BAS.MY Kuala Terengganu	20	−2.8 min	55%	counted from, not shown
BAS.MY Alor Setar	41	−3.2 min	41%	counted from, not shown
BAS.MY Kuching	31	+60 min	35%	not used
Rapid KL	55	hours off	5%	not used

When buses waiting at the start of their trip really set off (first seen 150 m away), against their trip's timetabled departure, 21 November 2026, 16:20 to 18:40. A few in most services left 25 to 120 minutes before their trip's time: buses given the trip after the one they ran.

- **Departure shown** (Kota Bharu, Kangar, Melaka, Johor Bahru, Seremban, MRT feeders): the minutes count from it, plus the service's usual lateness (2 minutes in Kota Bharu, half a minute in Kangar, 1.5 elsewhere), plus the drive.
- **Counted from, not shown** (Alor Setar, Kuala Terengganu, Ipoh): their buses follow it but off it (Alor Setar's mostly leave 3 minutes early, so a rider going by the time shown could miss the bus), so no time is shown; the minutes count from it with their own lateness (−3.3, −1 and 1.8 minutes).
- **Not used** (Rapid KL, Rapid Penang, Kuching): the minutes are the drive plus how long such buses really went on waiting (Kuching's 23 minutes, Rapid KL's 15).

A trip that hasn't started yet

Kota Bharu's, Kangar's, Alor Setar's and Kuala Terengganu's feeds give a bus its next trip early, while it's parked along the route or driving to the trip's start. That Sunday before 06:00, all of Kota Bharu's live times were for trips timetabled to start 15 minutes or more later; Kangar's R12 at 04:46 showed "1 min" for a trip that left at 06:30. Such a bus is now "Not departed yet" until 15 minutes before its trip starts, unless it is going along the trip's line (200 m on over the last 4 minutes). Replayed on the same buses:

SERVICE	FIRST BUSES, BEFORE	AFTER	06:47–08:04, BEFORE	AFTER
BAS.MY Kota Bharu	0% · 30.7 min	**65% · 3.2 min**	43% · 5.0 min	43% · 4.7 min
BAS.MY Kangar	7% · 31.1 min	**39% · 8.0 min**	48% · 4.7 min	48% · 4.6 min
BAS.MY Alor Setar	46% · 9.1 min	**54% · 3.3 min**	41% · 4.3 min	42% · 4.5 min
BAS.MY Kuala Terengganu	25% · 9.0 min	**27% · 8.1 min**	41% · 6.7 min	42% · 5.5 min

Within 2 minutes · mean miss. First buses 04:46 to 06:03, 22 November 2026.

6 Trips the timetable doesn't have

About one live trip in seven (21 November 2026) has an id its timetable doesn't: Seremban numbers its trips its own way, Kuala Terengganu, Ipoh and Rapid KL run trips past their pattern's last, Causeway Link's Johor Bahru feed is on a newer timetable version than the one published, and the MRT feeders' trips aren't in their timetable at all. Those buses had no arrival times. Now each is matched to a trip of the same pattern (the same stops and line), else of the same route, whose line it's on (within 150 m) and whose timetable has a bus where it is closest to now. Its arrivals are timed along that line, and no departure time is taken from that trip's timetable, as it isn't the bus's own.

7 What was wrong before

Measured on Saturday 21 November 2026, 16:20 to 18:10:

BEFORE	NOW
Rush-hour factors on top of timetables. Rapid KL and the MRT feeders were timed from timetables that allow a median 18.6 and 17.1 km/h between stops, the same at every hour. From 16:00 to 19:00 every timetable-based time was × 1.3 and every distance-based time used 70% of the speed (× 1.43), weekends too; from 7:00 to 9:00, × 1.2 and × 1.33.	The pace buses are making now, which already includes traffic and the time of day.
BAS.MY's speed is always 0. Kota Bharu, Ipoh and Alor Setar fell back to a fixed 32 to 34 km/h, × 0.7 in the evening (22 km/h), plus up to 3 minutes for a bus standing still.	The measured pace of the service's moving buses.
Straight line × 1.4 for the feeds without distances along the line, rounded up.	The distance along the route line.
Timetables in whole minutes. Johor Bahru, Melaka, Kuching, Seremban, Kangar and Kuala Terengganu were timed from their timetables (× 1.3 in the evening). Seremban's give every stop the same minute; Johor Bahru's and Melaka's mostly do (74% and 62%).	No timetable minutes: distance and pace.
Buses waiting at their first stop counted down from the drive alone while they stood.	"Not departed yet", with the departure time where it holds.
Jumping minutes when a bus was put on another pass of its line.	Steady minutes (section 4).
No time at all for about one trip in seven.	Matched to a trip of the same stops and line.

8 Results

The old code and the current code were replayed on the same buses at the same moments (`replay.mjs`), against when each bus really reached its stop, found from its GPS track. Buses on their way, at moments from 17:15 to 18:01 on 21 November 2026, a stretch the pace settings weren't fitted on (Kangar and Kuala Terengganu 17:24 to 18:18, where nothing was fitted).

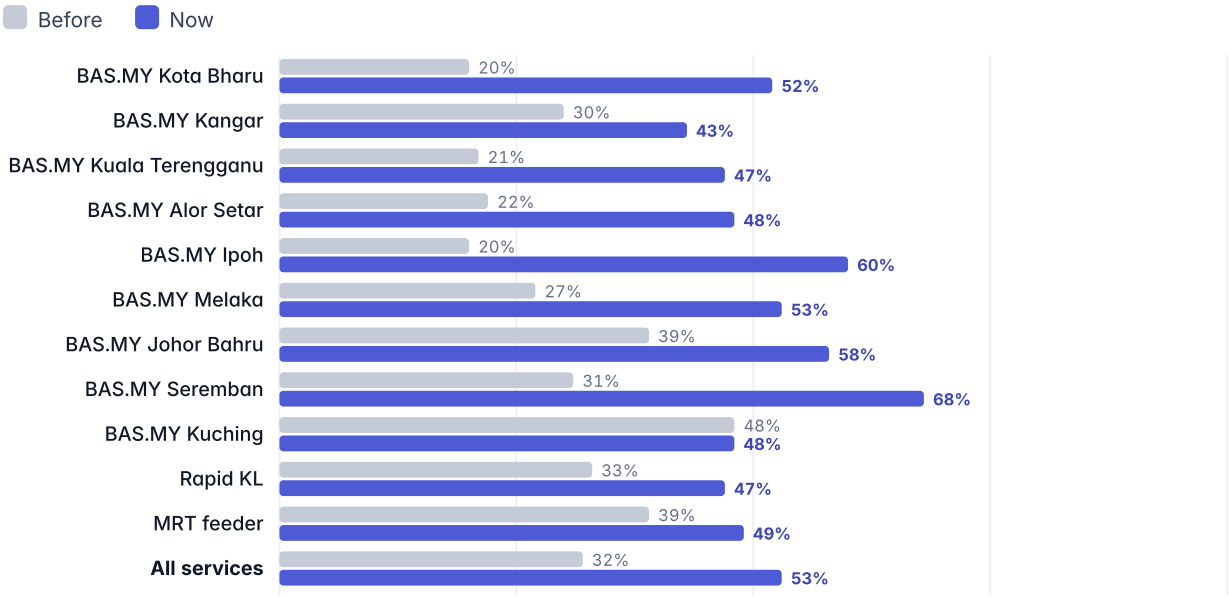


Figure 4. Live times within 2 minutes of when the bus really reached the stop, before and now.

SERVICE	SPEED, KM/H MOVING / DOOR TO DOOR	BEFORE BIAS · MISS · WITHIN 2	NOW BIAS · MISS · WITHIN 2	CHANGE
BAS.MY Kota Bharu	40.7 / 31.5	+3.8 · 9.5 · 20%	**−1.2 · 6.7 · 52%**	**+32 pts**
BAS.MY Kangar	39.2 / 26.0	+3.0 · 7.9 · 30%	**−0.8 · 4.6 · 43%**	**+13 pts**
BAS.MY Kuala Terengganu	32.7 / 20.3	+4.0 · 9.6 · 21%	**+0.8 · 5.4 · 47%**	**+26 pts**
BAS.MY Alor Setar	33.2 / 28.3	+2.8 · 9.7 · 22%	**−0.3 · 5.9 · 48%**	**+26 pts**
BAS.MY Ipoh	34.1 / 24.1	+5.0 · 7.2 · 20%	**+0.9 · 2.9 · 60%**	**+40 pts**
BAS.MY Melaka	33.7 / 28.9	+3.4 · 7.0 · 27%	**+0.1 · 3.6 · 53%**	**+26 pts**
BAS.MY Johor Bahru	28.3 / 28.4	+0.9 · 6.3 · 39%	**−0.3 · 4.4 · 58%**	**+19 pts**
BAS.MY Seremban	43.1 / 34.5	+3.8 · 4.8 · 31%	**+1.5 · 2.5 · 68%**	**+37 pts**
BAS.MY Kuching	33.8 / 19.5	−0.3 · 3.3 · 48%	**−0.7 · 3.6 · 48%**	±0 pts
Rapid KL	22.5 / 19.9	+1.4 · 7.1 · 33%	**+0.3 · 6.3 · 47%**	**+14 pts**
MRT feeder	22.0 / 24.6	+1.4 · 7.8 · 39%	**−0.4 · 6.4 · 49%**	**+10 pts**
All services		**+2.0 · 7.3 · 32%**	**−0.2 · 4.9 · 53%**	**+21 pts**

Bias: how much later than the bus the time said (minutes, median). Miss: mean absolute difference (minutes). Change: within 2 minutes, in percentage points. Rapid Penang's feed was down that day; Kuantan has no live positions. "Moving" is the buses' median speed between GPS reports while moving; "door to door" the timed buses' pace to their stop, stops included.

By how far away the bus was

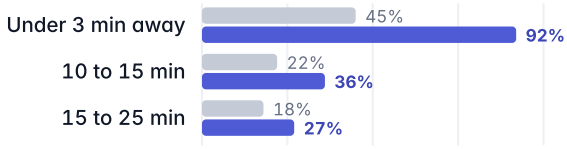


Figure 5. Within 2 minutes, all services.

Further out the new times tend to be early (by 2 minutes at 15 to 25 minutes away, 6 at 25 to 45): buses that stand a long time on the way can't be foreseen, and early is the side that doesn't make a rider miss the bus.

Buses waiting at the start

SERVICE	BEFORE	NOW
Kota Bharu	14.9 min · 12%	**3.1 min · 54%**
Kangar	15.9 min · 8%	**3.0 min · 46%**
Kuala Terengganu	20.3 min · 7%	**4.4 min · 35%**
Alor Setar	23.8 min · 9%	**4.0 min · 37%**
Ipoh	11.3 min · 14%	**2.8 min · 57%**
Johor Bahru	6.8 min · 24%	**4.7 min · 60%**
Melaka	7.1 min · 22%	**4.9 min · 28%**
Kuching	19.6 min · 7%	**13.0 min · 6%**

Mean miss · within 2 minutes. The apps show these buses as "Not departed yet"; the minutes order the list and drive Track this bus. Kuching's waits are the least predictable: a quarter under 10 minutes, a quarter over 41.

A weekday morning

Monday 23 November 2026, 03:42 to 09:30, all 11 areas: 7,108 bus-and-stop pairs, times checked at 139,397 moments, with the code as it ran that morning (before the pace fix of section 3). Within 2 minutes, buses on their way:

SERVICE	FIRST HOUR	06:00–07:00	07:00–08:49	SUNDAY 07:00–08:49
BAS.MY Alor Setar	48%	50%	47%	46%
BAS.MY Ipoh	44%	44%	**45%**	59%
BAS.MY Johor Bahru	57%	63%	**50%**	61%
BAS.MY Kangar	39%*	47%	43%	49%
BAS.MY Kota Bharu	29%	42%	51%	44%
BAS.MY Kuala Terengganu	21%	44%	41%	42%
BAS.MY Kuching	12%	35%	42%	44%
BAS.MY Melaka	44%	45%	50%	59%
BAS.MY Seremban (B)	76%	79%	**54%**	84%
Rapid KL	60%	50%	**39%**	52%
Rapid Penang	57%	52%	**44%**	feed down
MRT feeder	55%	54%	51%	59%
All	48%*	50%	46%	52%

* Before 06:00. No pairs were picked 05:11 to 05:41, so five services' first hour starts at 05:41. Seremban (B): under 200 times each.

The weekday rush is traffic, route by route. Rapid KL's buses made 17.5 km/h door to door from 07:00 (28.4 on Sunday). Its 220, 400, 600, 640, 190 and 303, and Rapid Penang's 701, took 1.4 to 2.2 times as long as their times said; Rapid KL's 421, 750 and 173 were on time. Nothing replayed did better: the bus's own pace counting more, slower buses counted in, longer stops, each route's own pace, or every rush time stretched by 10% or 20% (Rapid KL 39% → 38% → 36%). So the model stays; its rush times run short, the side that doesn't make a rider miss the bus.

9 Limits of live times

- **Long stops on the way** can't be foreseen: two of Kangar's buses stood 17 and 18 minutes at stops mid-route.
- **Detours and GPS jumps.** A position far off the line is held until the next reports confirm it; Kuala Terengganu's, Kuching's and Alor Setar's GPS positions jump most, which is most of what's left of the jumping minutes.
- **Feeds that stop.** While a service's feed is down (Rapid Penang's, on 21 and the morning of 22 November 2026), only timetable times can be shown.
- **Waits at the start.** How long a bus stands before leaving is the least predictable part of any time.
- **Weekday rush traffic.** The live pace follows traffic as it is, not the jam ahead of a bus. How long each route takes at each hour, learned from the records (Part 2), may help once a few weeks are recorded.

PART 2

Punctuality

From 21 November 2026, Malaysia Transit records when every bus with a live GPS feed left its trip's first stop and when it reached each stop after it, with the timetabled time beside each. Those records give the "on time today" lines and bars on the stop popups, Departures and the trip history page.

10 Recording every bus

- **Every 30 seconds** every data.gov.my live feed is read, the rate the feeds refresh; an area whose feeds are empty at night is asked every minute, so the first buses are seen waiting at their terminals.
- **Matched and placed.** Each report is matched to its timetabled trip, and placed on the trip's line near where the bus was last, so a loop's repeated streets go to the right pass.
- **Stops timed.** Between two reports the bus covered a stretch of the line; each stop on it is timed by where it sits, as if the bus moved at an even pace. A stop counts as reached 30 m short of it. A bus standing still moves its last report's time on, so its wait isn't spread over the stops after it.
- **Departure.** A bus first seen at its first stop, or within 150 m past it, is waiting; it has left when it is 50 m past the stop or the place it waited, so GPS jitter at the pole isn't taken for leaving. On Rapid KL, whose feed puts a bus on its next trip only once it has left, a departure first timed at the 2nd or 3rd stop is worked back by how long that day's buses took to get there (a median 14 seconds off, 89% within a minute), and flagged approximate.
- **Gaps.** Stops timed across a gap of over 5 minutes between reports are flagged; a jump faster than 30 m/s isn't driving, and the run picks up from there.



Figure 6. A stop between two reports is timed by where it sits on the stretch the bus covered.

11 How accurate the records are

The logs of 21 November 2026 (16:20 to 18:40, 12 services) were replayed through the recorder, and each stop time compared with an independent measure: the moment the bus's GPS track passed within 60 m of the stop.

SERVICE	STOPS COMPARED	MEDIAN DIFFERENCE	WITHIN 30 S	WITHIN 60 S
BAS.MY Kuching	223	−2.6 s	98%	99%
BAS.MY Kangar	107	−2.2 s	96%	96%
BAS.MY Kota Bharu	223	−2.0 s	95%	96%
BAS.MY Melaka	304	−1.8 s	95%	96%
Rapid KL	121	−1.3 s	95%	95%
BAS.MY Johor Bahru	351	−2.4 s	94%	94%
BAS.MY Kuala Terengganu	102	−2.3 s	93%	93%
BAS.MY Alor Setar	159	−2.1 s	92%	94%
BAS.MY Ipoh	251	−2.2 s	92%	94%
MRT feeder	286	−2.4 s	80%	80%
All	**2,166**	**−2.2 s**	**92%**	**93%**

The 2 seconds early is the 30 m before the stop. Most of the rest are passes the recorder missed. On the MRT feeders, nearly all loops (93% of their trips end at their first stop), that is still one stop time in five: the first thing to improve.

12 On time, early, late

A bus is **on time** from 1 minute early to 5 minutes late, against its own trip's timetabled time at that stop. More than 1 minute early is **early**: a rider who came on time would have missed it. More than 5 minutes late is **late**.

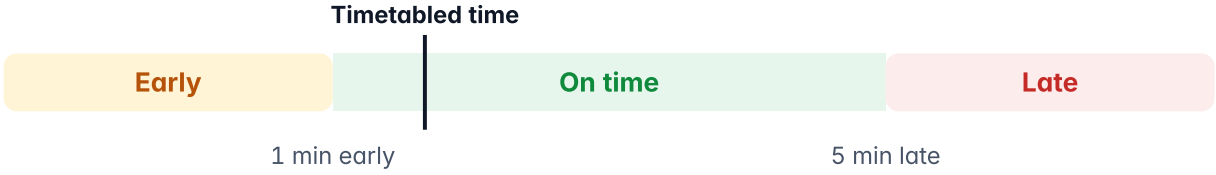


Figure 7. The on-time band, as the Trip history page and the apps count it.

The bar shows today's buses in proportion: green on time, amber early, red late. On Departures, grey is a timetabled departure no bus was seen running, and the faintest grey one not compared. A headline such as "13 of 16 on time" is green when at least half were on time, otherwise the colour of what most buses did.

What never counts against a bus

Not recorded: Malaysia Transit wasn't recording then (a gap, or before 21 November 2026). **Not seen**: no bus on that trip in the live feed while the provider's other buses were being recorded around it, so a gap in the recording never counts against a bus. Trips the timetable doesn't have are recorded but not compared: their timetabled times would be another bus's.

13 Each service's timetable

A bus can only be held to a timetable that is its own. Each service was checked on its own.

SERVICE	COMPARED WITH	WHY
BAS.MY Kota Bharu, Kangar, Alor Setar, Kuala Terengganu, Ipoh, Melaka, Seremban; MRT feeder	its own trip	Its buses run the trips they carry (85% of Johor Bahru's departures within 3 minutes of their trip's time, 78% of Kota Bharu's).
Rapid Penang	its own trip	Since its feed came back on 22 November 2026, its trip ids match the timetable's: of 91 departures, 89% left from 1 minute early to 5 late of their own trip's time.
BAS.MY Kuching	nearest departure	Its buses keep to the timetable but carry trip ids an hour or two off. Against the nearest timetabled departure of the same route, direction and first stop (within 30 minutes), 87% were on time; against their own ids, 42%.
BAS.MY Johor Bahru	its own trip, or the nearest departure for a trip hours off	J32's 8 morning runs on 22 November 2026 carried trips 2 to 15 hours off, yet each left within 3 minutes of a timetabled J32 departure.
Rapid KL	its usual times	Its live data doesn't say which departure each bus runs: under 1 in 10 left within 3 minutes of their own trip's time, most 2 hours or more away. On 22 November 2026, only 202 of its 494 departures were within 30 minutes of any timetabled departure of their route (a median 1.5 minutes after it). The trip history page shows that median in its colour but in a dashed outline, marked with an asterisk.

14 Usual times and "as usual"

Where the timetable can't be held to, the records themselves say what's usual. For Rapid KL, the MRT feeders and Rapid Penang, the server learns when buses actually leave each first stop and come to each stop.

- **Which days.** The last 28 finished service days of the same kind: weekdays; Saturdays and Sundays together until each has 3 of its own. They start once 3 days of that kind were recorded from morning to evening (07:00 to 21:00): weekdays on 26 November 2026, weekends on 5 December. Malaysia Transit's own recordings only, never the archive.

- **Hour by hour.** 4 or more buses in the hour on a typical day (every 15 minutes or less): "about every N minutes", with the usual spread of gaps. Otherwise each time the buses came within a few minutes of on at least half the days is a usual time; an hour whose buses keep no such times is "about N buses an hour, at no fixed times".

Rapid KL against its usual times

Quiet hours. Each bus is compared with the usual time of its route, direction and stop nearest it, within 15 minutes: as usual from 1 minute earlier to 5 minutes later, later than usual or earlier than usual beyond that.

Busy hours. The minute a bus comes means little, so the gap after the route's bus before it counts: twice the usual gap or more (and beyond the usual spread) is later than usual, a long wait; a quarter of it or less is earlier, bunched right behind.

Not judged: hours with no fixed pattern or not recorded on enough days, the first bus of the busy hours, a bus far from any usual time. Never called on time or late: these aren't a timetable.

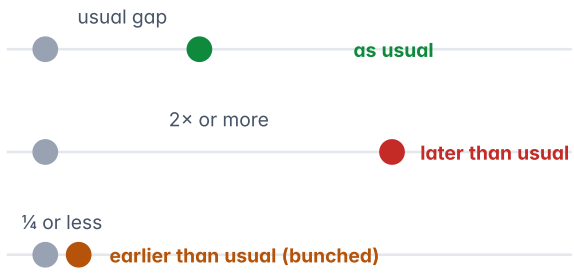


Figure 8. In busy hours a bus is judged by the gap after the bus before (grey) against the usual gap.

15 Limits of the records

- A stop time is only as good as the GPS behind it: about 1 stop time in 5 on the MRT feeders' loops is still missed.
- Buses with no live feed (Kuantan) and trips no timetable has (Rapid Penang's T routes, 29 buses on 22 November 2026) aren't recorded; nor are buses not on a trip.
- Rapid KL and MRT feeder days from January 2025 to 20 November 2026 are rebuilt from Khazanah Research Institute's archive: kept apart, labelled, with no timetabled times, and never mixed with live recordings.

APPENDICES

A Methods and tools

All in the middleware's `scripts/eta-study/`. The server measured was started locally and asked for every bus's minutes every minute, while every bus's position was logged every 20 seconds.

Check it yourself. The code named here (the arrival times, trip history and punctuality, and the arrival code as it ran before 21 November), the tools, their tests and the method notes can be downloaded at **malaysiatransit.techmavie.digital/downloads/malaysia-transit-methods.zip**, for review only (its LICENSE.md says what's allowed); the study's logs and the timetables they used at **malaysiatransit.techmavie.digital/downloads/malaysia-transit-study-data.tar.xz**, under CC BY 4.0. Its README says how to replay the evening of 21 November and what you should get. The weekday morning of 23 November (section 8) isn't in that download.

TOOL	WHAT IT DOES
`collect.mjs`	Logs every bus's position every 20 s, and follows (bus, stop ahead) pairs 2 to 30 stops ahead, asking the server for that bus's minutes every minute.
`analyze.py`	Finds when each bus really passed its stop, from its positions (within 60 m).
`replay.mjs`	Runs the logged buses through the server's own arrival code at the moments logged, with the clock set to each: the current code, or an older commit's. Checked against the servers themselves, the old code gave the old server's logged times to within a minute 96 to 100% of the time per service.
`score.py · jumps.py`	Set two replays side by side against when the buses really reached their stops; measure how far each minute's time moves off a steady countdown.
`fit.py · per_service*.py`	Fit the pace scale and stop time, shared and per service, on the first half of the evening by time; checked on the second.
`service_pace.py · terminal.py`	Measure each service's typical pace minute by minute, and compare first-stop departures with the timetable.

B Glossary

GTFS / GTFS Realtime	The open formats transit data is published in: timetables, routes and stops (GTFS), and live positions (GTFS Realtime).
Trip	One run of a route at a timetabled time, from its first stop to its last.
Route line	The path a trip follows on the map (its shape), along which distances are measured.
Pace	Average speed including the time standing at stops and lights.
Within 2 minutes	A live time that said the bus would come no more than 2 minutes before or after it really did.
Bias · mean miss	How much later than the bus a time said (median); how far off it was on average, either way.
Not departed yet	A bus still waiting at the start of its trip.
Usual times	When a route's buses really leave and come, learned from recent recorded days of the same kind. Never an official timetable.

C Sources and credits

Live positions: data.gov.my, GTFS Realtime, Creative Commons Attribution 4.0 (CC BY 4.0). **Timetables:** each operator's GTFS, through data.gov.my and the operators.

Rapid KL and MRT feeder history before 21 November 2026: Gregory Ho Wai Son and Kelvin Ling Shyan Seng, *Greater Kuala Lumpur Mobilities* (GKLMOB), Khazanah Research Institute, 2025, krinstitute.org/publications/gklmob, Creative Commons Attribution 3.0 (CC BY 3.0).

Malaysia Transit is an independent app, not a government one, and isn't affiliated with or endorsed by any government entity or transit operator. Questions and corrections: hello@techmavie.digital.

Measurements: 21 and 22 November 2026. The live versions of this paper's explanations: malaysiatransit.techmavie.digital/arrival-times.html and /trip-history.html.