

- New route advice formats
- Integrated new optimal speed algorithm
- Benefits of enhanced optimal speed routing
- Vessel-specific performance models

Your New DTN Solution Highlights

Better meet your unique voyage objectives

with RouteGuard's newly enhanced report and route recommendations

Finding an optimized route that meets your unique objectives has never been more critical or challenging. Newly enhanced route recommendations in RouteGuard report makes it easier. Designed with feedback from our customers and enhanced with innovative data models, it delivers better, higher-value route optimization data for every voyage, including:

- Improved route advice format for ships.
- New additional route features in each report.
- A new optimal speed routing algorithm.
- An option to incorporate your vessel-specific performance models in route calculations.

New route advice formats

With the new formats, onboard crews can make better use our analysts' trusted advice. DTN[®] route analysts can now send the following file types to ships:

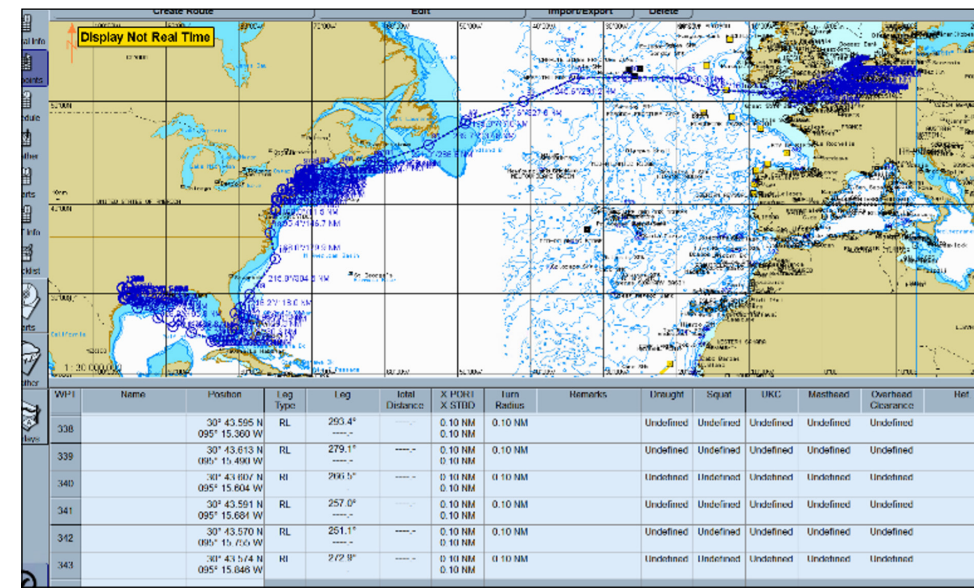
- An initial route advice PDF.
- A daily route advice PDF.
- Route RTZ file (RTZ v1.0 with minimum mandatory elements).
- Route CSV file (JRC ECDIS format).

New RTZ and CSV files

- Contain all the main navigational waypoints in the route advice.
- Can be imported on ECDIS systems onboard.

- Most service vessels should be able to import at least one of the available electronic route files, which can be used onboard to:
 - Help remove the burden from officers who otherwise must manually enter hundreds of waypoints on ECDIS.
 - Allow crews to easily see differences in the route by importing the new route in ECDIS and comparing it with the active route.
 - Help ships more consistently follow DTN route advice.

DTN can send SPOS files together with route advice. This file can be imported easily in DTN SPOS software when in use onboard.



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New route advice PDFs

With various additional features in each report, the enhanced route advice PDFs support improved decision-making. The data-rich reports now include:

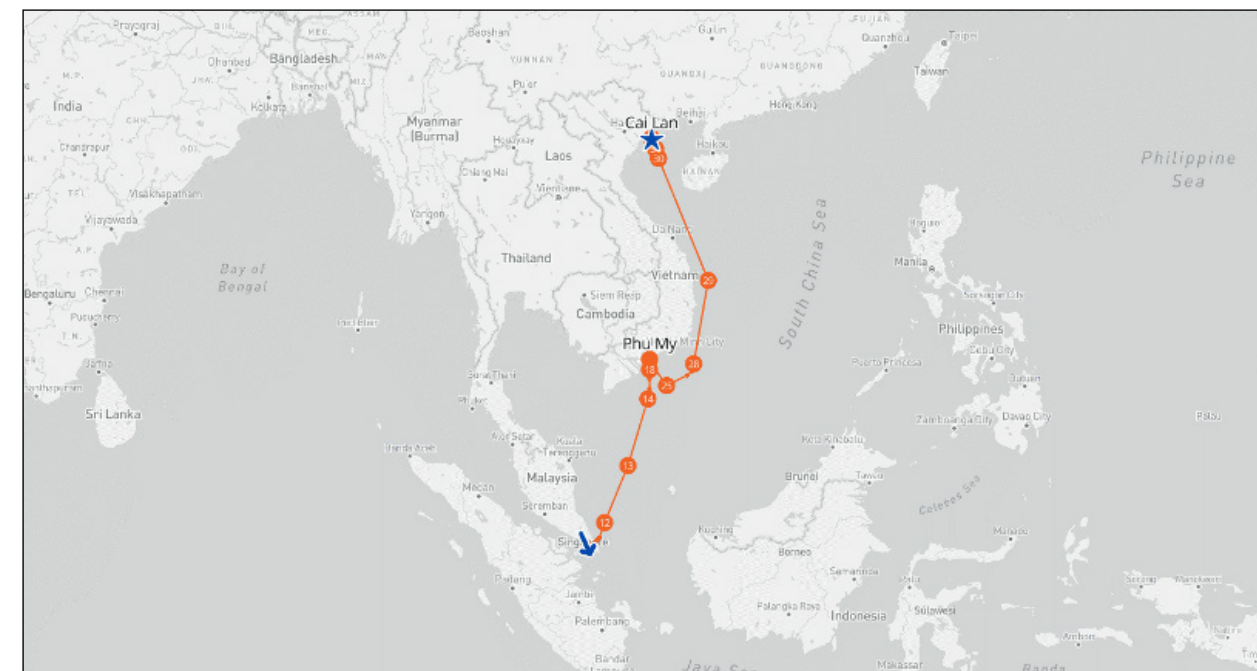
- A first page with a summary table, overview map showing the advised route, and important commentary from the DTN route analyst.
- The next set of images shows the weather forecast along the calculated route.
- The following pages contain the waypoint table.
- The next section of the report contains the weather table.
- The last page contains a time series graph showing calculated SOG with 10m wind speed and total significant wave height that the ship is expected to encounter in the weather forecast period.

Example: Summary table

Daily Route Advice	
Voyage Name	Optimal Speed Routing; BAHIA BLANCA - SINGAPORE - PHU MY - CAI LAN
Starting Engine Load Advice (%MCR)	19.5
ETA At Next Intermediate Stop (UTC)	Phu My / 20 Jul 2023 03:22
ETA At Next Intermediate Stop (Local Time)	Phu My / 20 Jul 2023 10:22
ETA Destination (UTC)	Cai Lan / 31 Jul 2023 23:24
ETA Destination (Local Time)	Cai Lan / 1 Aug 2023 06:24
Remaining Distance To Destination (Nm)	1471.0
Remaining ECA Distance To Destination (Nm)	0.0
Routing Service / Optimization Type	Optimal Speed / Cost
Last Logged Position / Start Position (UTC)	1° 16' 43" N 103° 58' 17" E @ 17 Jul 2023 09:07
Loa / Beam	229 m / 32.26 m
Draft Fwd / Draft Aft / Loading Condition	- / - / Loaded

- Includes ETA at the next intermediate stop, which can be an interim port, bunker stop, armed guard stop, or a drifting location, and at the final destination, both in UTC and the local time zone of the stop.
- Remaining total distance and remaining ECA distance to the final destination.
- Starting engine load advice (only when a ship-specific speed power curve is provided).

Example: Overview map of advised route



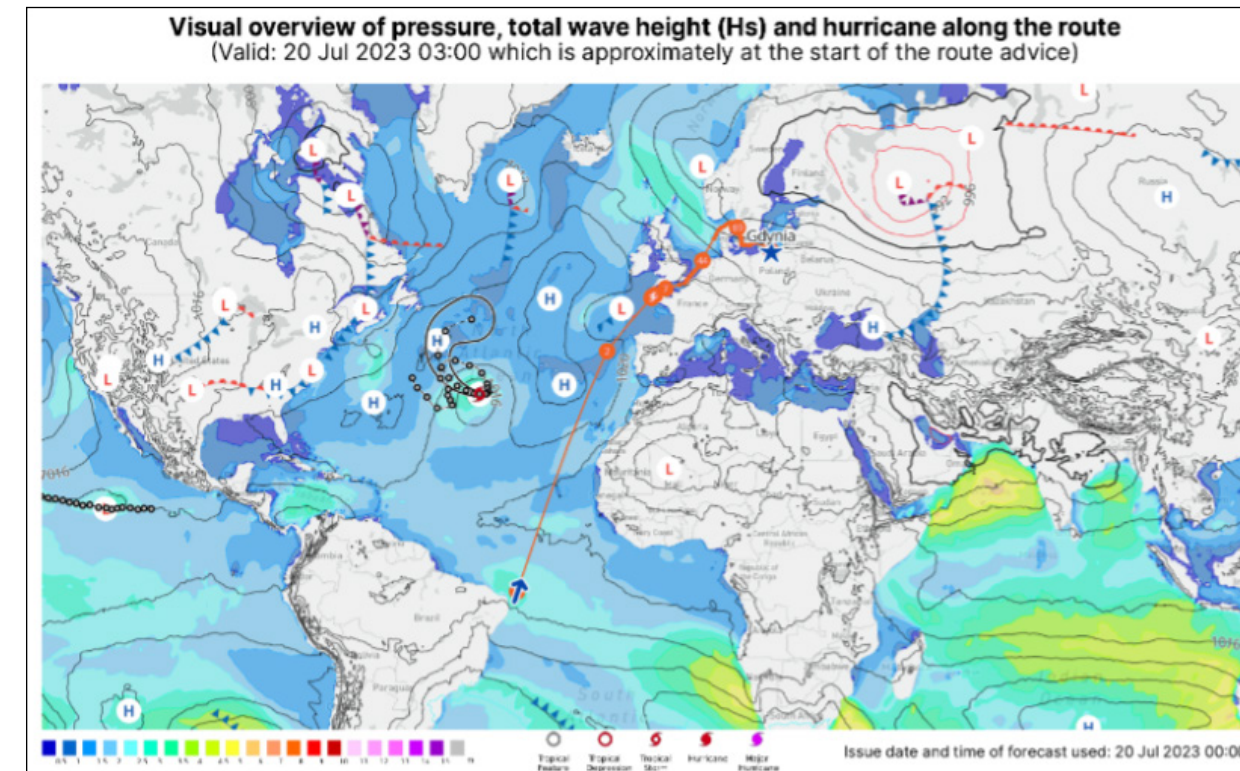
- Shows the current vessel position.
- Includes the location and name of the final destination with intermediate stops.
- Some hard waypoints are numbered to match the numbering in the waypoint table.

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Some key features include:

- The start of the route advice (the zoom level shows the entire remaining route).
- Plots for pressure, total wave height (Hs), and hurricane information.
- Weather forecasts at the start of the route advice, at + 24 hours, and at + 48 hours.
- When the route starts from outside the forecast period – which can happen when initial route advice is made well in advance of the estimated time of departure (ETD) – all the images will be removed from the route advice PDF.

Example: Weather along the calculated route



The weather image shows the calculated vessel position with the issue date of the forecast used for plotting and the valid time for the plotted weather.

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Some key features include:

- ETA at all intermediate stops and the final destination in both UTC and the local time zone of the stop.
- Expected delays at intermediate stops; typically provided by the client requesting the route advice.
- It shows only the main navigational waypoints when the weather forecast ends and DTN starts using climatology.
- Distance and track type in the table are only reported for main navigational waypoints, and these values are measured/valid from the previous main navigational waypoint.
- Contains Wx (expected speed loss due to wind and waves) and Cx (expected speed loss due to current) at all waypoints.
- Engine load, speed advice, and resulting STW, SOG, Wx, and Cx values in the table are all averages since the last waypoint.
- Engine load advice is given only when the speed – power curve of the main engine of the vessel – is provided by the client.
- Rows filled in green mark waypoints that are inside the ECA region, including entry and exit points.

Example: Waypoint table

WPs	ETA (UTC) (DD-Mon / HHMM)	LATITUDE	LONGITUDE	Name / Delay (hours)	ETA (Local Time) (DD-Mon / HHMM)	DISTANCE (nm)	Track Type	Engine load advice (%MCR)	SICW (SPEED ADVICE) (kn)	STW (kn)	SOG (kn)	WEATHER EFFECT (Wx) (kn)	CURRENT EFFECT (Cx) (kn)
1	17 Jul / 09:07	1° 16' 43" N	103° 58' 17" E			-	-	-	-	-	-	-	-
2	17 Jul / 09:15	1° 15' 45" N	103° 58' 43" E			1.1	RL	19.5	8.4	7.7	7.7	-0.7	-0.1
3	17 Jul / 09:20	1° 15' 14" N	103° 58' 56" E			0.6	RL	19.5	8.4	7.7	7.6	-0.7	-0.1
4	17 Jul / 09:25	1° 14' 38" N	103° 59' 12" E			0.7	RL	19.5	8.4	7.7	7.6	-0.7	-0.1
5	17 Jul / 09:28	1° 14' 41" N	103° 59' 35" E			0.4	RL	19.5	8.4	8.0	8.0	-0.4	0.0
6	17 Jul / 10:03	1° 15' 18" N	104° 4' 14" E			4.7	RL	19.5	8.4	8.0	8.0	-0.4	-0.0
7	17 Jul / 10:29	1° 15' 3" N	104° 7' 45" E			3.5	RL	19.5	8.4	7.9	8.3	-0.5	0.4
8	17 Jul / 11:55	1° 16' 32" N	104° 19' 27" E			11.8	RL	19.5	8.4	7.9	8.2	-0.5	0.3
9	17 Jul / 13:14	1° 23' 53" N	104° 27' 55" E			11.2	RL	19.5	8.4	8.1	8.6	-0.3	0.4
10	17 Jul / 13:48	1° 27' 30" N	104° 31' 20" E			5.0	RL	19.5	8.4	8.2	8.8	-0.2	0.6
11	17 Jul / 14:44	1° 33' 40" N	104° 37' 10" E			8.5	RL	19.5	8.4	8.2	9.0	-0.2	0.8
X	17 Jul / 18:44	2° 10' 46" N	104° 50' 14" E					19.5	8.4	8.3	9.9	-0.1	1.5
12	17 Jul / 19:30	2° 17' 58" N	104° 52' 46" E			47.0	RL	19.5	8.4	8.3	10.0	-0.1	1.7
X	17 Jul / 23:30	2° 53' 36" N	105° 7' 17" E					20.9	8.6	8.6	9.6	-0.0	1.1

The numbered waypoints are the main navigational waypoints for ECDIS. The rest of the waypoints (marked X) provide weather impact along the track every four hours.

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Some key features include:

- The waypoint sequence and numbering match the waypoint table.
- All weather data in the table (except risk speed and risk Hs) are average values since the last waypoint.
- Risk speed means that there is 90% confidence; meaning wind speed will not exceed this value since the last waypoint.
- Risk Hs means that there is 90% confidence that the significant wave height of the total wave (wind wave and swell combined) will not exceed this value since the last waypoint.
- All directions use standard nautical conventions.
 - Wind, waves, and swell are coming from these angles.
 - Current is going to this angle.
 - All angles are measured from true north.
- When the route starts from outside the forecast period – which can happen when initial route advice is made well in advance of the ETD – this weather table is removed from the route advice PDF.

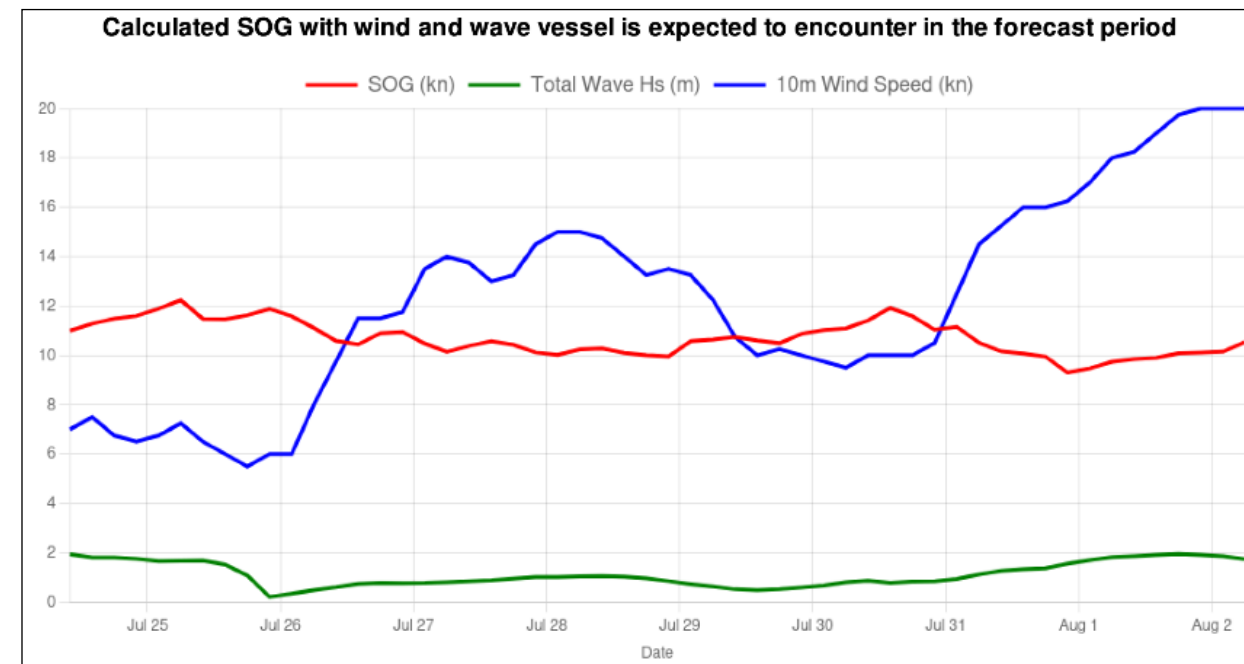
Example: Weather table

Expected weather conditions at waypoints along the route

WPs	ETA (UTC) (DD-Mon / HHMM)	HPA	10 M Wind			50 M Wind		Gust			Total Wave		Wind Wave		Swell		Current	
			Dir (degree)	Speed (kn)	Risk Speed (kn)	Dir (degree)	Speed (kn)	10m (kn)	50m (kn)	Hs (m)	Risk Hs (m)	Hs (m)	Mean Period (sec)	Hs (m)	Mean Period (sec)	Dir (degree)	Dir (degree)	Speed (kn)
1	24 Jul / 06:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
X	24 Jul / 10:00	1011	120	7.0	9.0	120	8.0	9.0	9.0	1.9	2.2	0.2	2.0	1.9	10.0	180	201	0.3
X	24 Jul / 14:00	1010	130	7.5	8.0	131	7.8	8.0	8.0	1.8	2.1	0.2	2.0	1.8	10.0	181	168	0.5
X	24 Jul / 18:00	1011	133	6.8	9.0	137	6.8	7.8	7.8	1.8	1.9	0.2	2.0	1.8	10.0	187	158	0.6
X	24 Jul / 22:00	1012	121	6.5	9.0	126	6.8	8.0	8.0	1.8	1.9	0.1	2.0	1.8	10.3	190	143	0.5
X	25 Jul / 02:00	1012	96	6.8	9.0	97	7.0	7.5	7.5	1.7	1.9	0.1	1.3	1.6	11.0	190	130	0.7
X	25 Jul / 06:00	1012	181	7.3	10.0	181	7.3	8.0	8.5	1.7	1.7	0.3	1.8	1.6	11.8	197	125	0.8
X	25 Jul / 10:00	1012	164	6.5	9.0	165	7.0	8.0	9.0	1.7	1.7	0.3	2.5	1.7	11.5	192	58	0.3
X	25 Jul / 14:00	1012	155	6.0	9.0	155	7.0	8.5	9.0	1.5	1.7	0.3	2.3	1.5	10.3	197	22	0.3
X	25 Jul / 18:00	1013	167	5.5	8.0	165	7.3	8.3	9.5	1.1	1.4	0.1	1.8	1.1	7.5	200	180	0.0
X	25 Jul / 22:00	1012	183	6.0	9.0	184	8.0	9.3	11.5	0.2	0.5	0.0	0.3	0.2	1.3	0	78	0.0
X	26 Jul / 02:00	1011	161	6.0	9.0	159	8.0	8.5	10.5	0.3	0.4	0.1	1.5	0.3	3.5	72	322	0.1
X	26 Jul / 06:00	1011	134	8.0	11.0	134	8.8	8.8	10.8	0.5	0.5	0.3	2.5	0.4	5.0	85	250	0.3

The weather table is used to report weather along the route for the forecast period.

Example: Time series graph



The last page of the report offers a time series graph showing calculated SOG with 10m wind speed and total significant wave height that the ship is expected to encounter in the weather forecast period.

Note: When the route starts from outside the forecast period – which can happen when initial route advice is made well in advance of the ETD – this time series graph will not be included in the PDF.

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Additional features in the new route advice

	Existing route advice	New route advice
Last logged position	✓	✓
The remaining distance to the destination	✓	✓
ETA at the final destination in UTC	✓	✓
Comments from the DTN route analyst	✓	✓
Waypoint table	✓	✓
Weather table	✓	✓
Engine load advice (MCR)		✓
ETA and delay information at all intermediate stops		✓
ETA in UTC and the local time zone		✓
Remaining ECA distance to the destination		✓
ECA entrance and exit coordinates		✓
Image with route overview		✓
Images with the weather forecast and route overlay at the start of route advice, +24 hours from the start, and +48 hours from the start		✓
Graph showing calculated SOG with wind speed and wave height that the ship is expected to encounter		✓
RTZ file of the route (RTZ v1.0 with minimum mandatory elements)		✓
CSV file of the route (JRC ECDIS format)		✓

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Integrated new optimal speed algorithm

Currently, our route analysts are primarily offering these weather routing services:

- **CP routing** – when a charter party must be followed, resulting in fixed instructed speed.
- **ETA routing** – when there is a strict ETA/laycan requirement, resulting in variable speeds to meet the time window in the most optimal way.
- **Optimal routing** – when there is no fixed ETA and the vessel's speed setting can be changed along the route to achieve the most optimal voyage results.

Our recently developed optimal speed routing algorithm allows our analysts to determine the most cost- and fuel-efficient routes. It combines the power of weather routing and speed optimization to create route advice that can potentially improve voyage profitability without sacrificing safety and efficiency.

Benefits of enhanced optimal speed routing

- Considers the most efficient route after accounting for all client restrictions.
- Finds the optimal speed route – the search not only considers all different possible routes but also the possible different speeds along the routes. This finds solutions with favorable weather conditions helping save fuel consumption and overall cost.
- Creates routes that are either optimized for overall costs – including fuel, emission, daily hire costs, etc. – or based on the total metric tons of fuel to be used.
- Avoids heavy weather conditions by either temporarily speeding up or slowing down; the speed advice is not always the local optimum, but the goal is to achieve the most optimum voyage outcome.
- Uses the entire speed range when there is no strict ETA, based on client-provided data, to support optimal results – with the client responsible for aligning with the vessel and ensuring that the crew can operate within the speed range.

Vessel-specific performance models

DTN recognizes that many customers have their own vessel-specific performance models, whether developed in-house or by a third party. Using these models in the DTN route calculation can result in more precise routes that are optimized for the vessel's latest performance. This new RouteGuard feature allows for such vessel-specific voyage calculations and can model:

- Speed-fuel-RPM-MCR curve of the main engine
- Speed fuel curve for other fuel consumption (aux + boiler)
- Vessel-specific speed loss

To request DTN route analysts include vessel-specific models in route calculations, customers must package and send their vessel-specific performance models in the DTN-provided format.

DTN can provide sample vessel performance models in XML format by request.

For assistance with your RouteGuard service or to learn more about the enhanced route advice, email our Shipping Operations Team at shippingoperations@dtn.com