

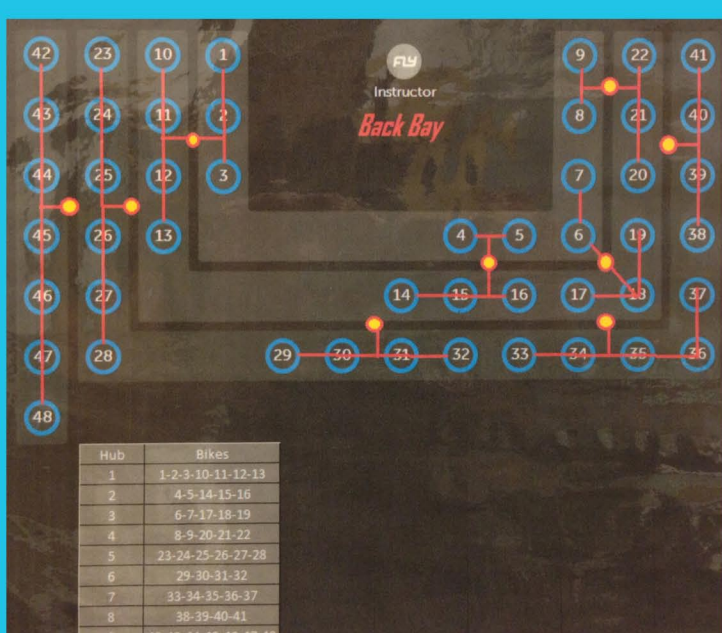
In our fitness crazed society Flywheel differentiates itself from the many other indoor cycling studios by the technology that it uses. At your average studio your bike is just a piece of equipment, at Flywheel it becomes so much more. All of the bikes have a small screen that displays data. You control this data by modifying your resistance and pedaling. Algorithms turn this data into points and tangible stats. While you're in a class you can opt in to have your stats shown on the "Torqboard" - a monitor that displays the people in the class accumulating the most points. This adds a level of competition subsequently making you work harder. Once the class is finished those numbers get translated into various amounts of data that help you track your performance not only in each class, but over time. Your physical results are turned into numbers that will show improvements. You can access this data through an online account and an app. The goal is get more out of your work out whatever your motives or desires might be.

The chart below shows web architecture in relation to Flywheel. Most of the clients do not think about the journey the data they create takes - all they know is they take a class and instantly they have stats at their disposal. If one layer of the OSI model fails, it throws off an entire balance that is tied to the user's/rider's experience both in class or when interacting with the technology associated.

ONE Physical Layer

"The physical layer defines the relationship between a device and a physical transmission medium"

Unbeknownst to riders, beneath the floor of Flywheel's studio runs a series of Ethernet cables, hubs, and USB's. This map shows where the hubs are located and what bikes they are connected to. Each bike has a small screen that displays a rider's RPM, Torq (resistance), "current power", and "total power" which are calculated from the RPM and Torq. Ethernet cables connect the hubs to a server that is in the studio.

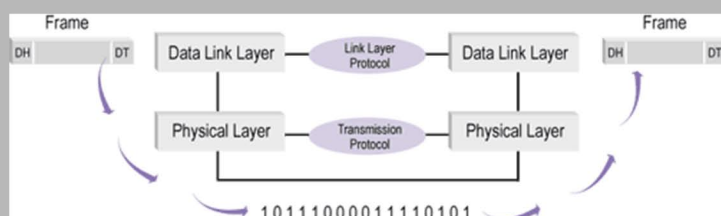
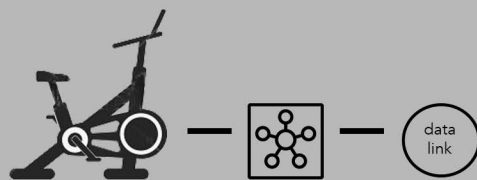


TWO Data Link Layer

"This is where node-to-node data transfer happens. Errors are detected from the physical layer and possibly corrected before the data is sent on its way."

Media Access Control (MAC) - controls how devices in a network gain access to data and gives them permission to transmit it
Logical Link Control (LLC) - controls error checking and packet synchronization

As the data for riders stats leaves the physical layer it hits the threshold of the data link layer where data packets are encoded and decoded into bits (0's and 1's). A sequence of these bits is part of a digital data transmission unit known as a frame. The flow of data is managed here as well. This is the first step of turning data into something meaningful.



THREE Network Layer

"Logical network addresses are translated into physical machine addresses and functions like routing, error handling, and packet sequencing happen at this layer. The physical path data should take based on network conditions are decided here."

When those bits leave the data link layer, this layer creates logical paths for that data to be transmitted node to node. This where IP addresses come into play. The IP address to the right is that of Flywheel's website. The server for the site is hosted by Amazon Web Services.

IP Lookup for 50.18.174.165

Reverse lookup: ec2-50-18-174-165.us-west-1.compute.amazonaws.com

```

PING 50.18.174.165 (50.18.174.165): 56 data bytes
Request timeout for icmp_seq 0
Request timeout for icmp_seq 1
Request timeout for icmp_seq 2
Request timeout for icmp_seq 3
Request timeout for icmp_seq 4
Request timeout for icmp_seq 5
Request timeout for icmp_seq 6

Request timeout for icmp_seq 7
Request timeout for icmp_seq 8
Request timeout for icmp_seq 9
Request timeout for icmp_seq 10
Request timeout for icmp_seq 11
Request timeout for icmp_seq 12
^C
--- 50.18.174.165 ping statistics ---
14 packets transmitted, 0 packets received, 100.0% packet loss
    
```

Pining this IP address yielded 100% packet loss

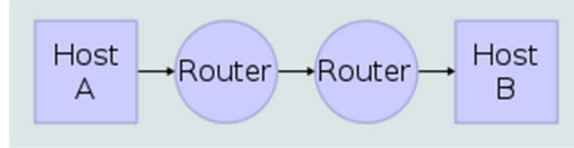
FOUR Transport Layer

"End-to-end connectivity where local connections between servers are established. It ensures complete data transfer."

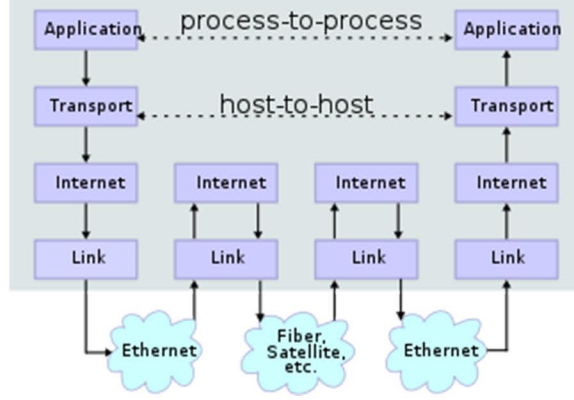
TCP works in this layer to establish connections where reliable connections are required and UDP is used in case of unreliable connections.

It is at this layer that the data packets are being prepared to be delivered to the session later by breaking them down into appropriately sized "chunks" and passing them off the network. At Flywheel two servers have to be able to accept the data. One server is in the studio, and then there is another server at the company's HQ that populates the website and app. The diagram shows where the transport layer falls in the topology of data flow.

Network Topology



Data Flow



FIVE Session Layer

"Connections between applications are established, managed, and terminated."

This layer is important to Flywheel. Clients create accounts through the website with user names and passwords. These accounts store the data from every ride and tracks it over time, as well as stores other information about riders including credit card information and transaction history. Cookies are part of this layer and are the mechanisms for storing this type of personal data and recognizing return users. The images are examples of instances on the Flywheel website where the session layer is responsible. Security is also imperative at this layer.

PAYMENT INFORMATION

Select a payment method from the following options.

Payment method: *

- Saved card ending with ...9040
- Saved card ending with ...8517
- Credit card:

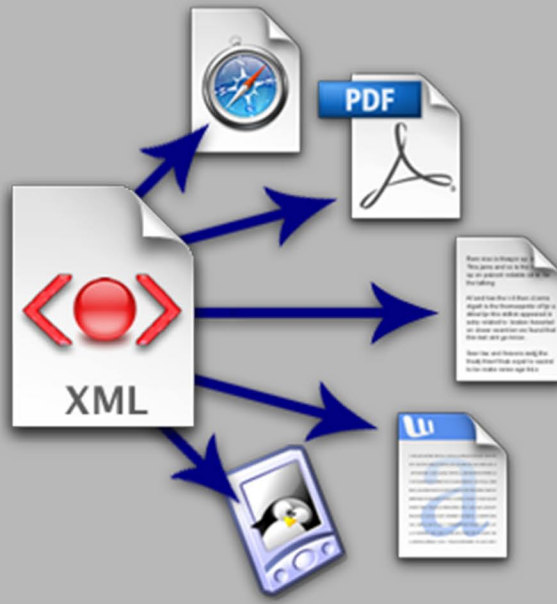
PERFORMANCE

	MY STATS	PERCENTILE
AVG RPM	67	85
MAX RPM	106	85
AVG TORQ	24	32
MAX TORQ	40	58
AVG SPEED	31.3	85
AVG TOTAL POWER	264	54
AVG TOTAL DISTANCE	22.4	76
TOTAL DISTANCE	823.1	N/A
AVG CALORIES BURNED ²	791	54
TOTAL CALORIES BURNED ²	29,466	N/A
TOTAL POUNDS LOST ¹	8.4	N/A

SIX Presentation Layer

"Data is formatted and encrypted for the particular application that is using it."

Flywheel has many different users from all around the world accessing their data from a variety of devices. It is important that all the data is presented in a standardized way whether the user is looking at the website or app on a computer, tablet, or mobile device from LA to Dubai. At this layer decisions are made about how data should be structured with XML encoding data to be read by both human and machine.



SEVEN Application Layer

"Supports end-user and application processes, like email, File Transfer Protocols, and web browsers."

Clients of Flywheel see the company for what it is through this layer. The first step is always the hardest, and for some clients their interaction with the website is the first step. It's possible to say that this precise web architecture and its functions are responsible for changing lives.

Users interact with the website and app. The data is seamlessly accessible between platforms.