

# Laws of Zoom

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In November 2019, the Zoom Video Communications platform had 10 million meeting participants per day worldwide. By April 2020, this number grew 30 times to 300 million daily participants (Vailshery 2022). The COVID 19 pandemic changed the role and scale of video conferencing in the daily lives of millions. But not only has the usage of Zoom expanded exponentially, so has the scope and breadth of what the application is technically capable of. This increase is not only internal but also externalized through a Zoom App Marketplace that allows third-party developers to build applications onto the Zoom infrastructure. While the marketplace already opened in 2018 (Zoom[developer], n.d. b), in February 2021, Zoom announced that the marketplace had grown to 1000 connected applications. One year earlier, the marketplace consisted of only 200 apps (Mullin 2021). The outreach of Zoom increased not only as a customer service but also as a networked meta-application containing a vast amount of additional software applications from outside developers. Zoom, in this sense, is not only an application, an independent code structure within the operating system, but rather a platform, a networked connector of supply and demand, regulating and influencing a broader networked system (Lovink 2021). The communication layer of this interdependent structure of relations is organized by the application programming interface, or API, which this article will examine. *This article investigates the Zoom API documentation by visualizing its organizing principles and structures. By doing so, one layer of the subface platform structure becomes a surface.* This investigation offers a perspective of the laws of Zoom from an outside developer. How is this perspective different than the graphical interface layer of its millions of users? And what mechanisms determine Zoom's relation to external companies developing apps within their platform?

Observing some of the external developers' apps for Zoom showcases the meaning behind Zoom's marketing claim of "keeping you connected." The applications on Zoom's Marketplace range from icebreaker games for teams (Playco, n.d.), to AI Note-taking transcriptions (Fathom, n.d.), to live Poll Apps, Quizzes, and Word Clouds (Mentimeter, n.d.). The categories by which Zoom separated its marketplace caught my attention—for example, analytics, customer relationship management, monitoring, productivity, or recordings. The question becomes, what is kept con-

nected by Zoom? The “you” in keeping you connected suggests a human or user connection, but what is connected are infrastructures of networked hard- and software. *Behind the term “you” lies a global infrastructure of hard- and software of internal and external code structures.*

*Zoom is more than a tiled canvas of talking heads.* Some of the Apps within the marketplace are very open about this. For example, the App People.ai advertises to “automatically capturing all contact and customer activity data” (People.ai, n.d.). What is labeled “actionable intelligence” is a software-based surveillance system to turn video conferencing into profit-oriented exploitation of surveillance data. Within the example screenshots of the app, various visualization dashboards are displayed, ranking individuals by meeting minutes, number of calls, “engagement,” and the number of scheduled vs. unscheduled meetings. Rather than “keeping you connected,” as Zoom articulates it on their home screen, the app store and the capabilities of listed apps convey the possibilities of surveillance and control. This is possible due to a wide-ranging Application Programming Interface (API) that Zoom opened up to outside developers.

The scope of the Zoom API is vast, with capabilities, affordances, and restrictions that lie far beyond the possibilities of this article. But like the just-introduced People.ai app, many others use visualization methods to monitor individuals using Zoom. I want to counteract this approach by using visualization methods to instead map the capabilities of the Zoom API. I will call this method *infrastructure imaging*. But before doing so, I will begin with a short introduction to the API.

## What Is the Zoom API?

API is an acronym for Application Programming Interface; it is understood as an intermediary between computer programs. The graphical user interface, or GUI, allows humans to interact with computational systems. The API does something similar but on the level of software to software interaction. The API is not intended for human usage apart from the computer programmer who uses it to write new software connected to already existing programs. *Thus the API is a human concept, made by humans for humans, but only a particular type: the developer.*

Through the GUI, a Zoom meeting participant learns how to chat during the meeting, invite others into the call, or leave the meeting. Similarly, a developer knows how to build new software connections toward the Zoom platform through the API description. The API is a socio-technical complex making certain sets of particular programmatic components available for developers to other programmatic components (see also Snodgrass and Soon 2019). That the API is a socio-technical complex centered around the developer is noted by Zoom explicitly in their API reference:

Figure 1: All parameters of the Zoom API

AccountID		FromDate		LoginType				MeetingId4Metrics				MeetingType														
path	The account's ID.	query	Start date in 'yyyy-mm-dd' format.	enum	0	11	97	99	path	meetingId	string	query	The meeting types.	enum	scheduled	live	x-enum-	all the scheduled meetings	x-enum-	all the live meetings						
accountid		from	string	login_type	1	21	98						type	enum	upcoming											
string	true	date	true	The user's login method: '0' = Facebook	23		27	100	101	MeetingUUID	meetingUUID	string	The meeting's universally	string	live											
				string	24																					
GroupID		DeviceID		x-enum-descriptions				MeetingId4Recording				MeetingTypePast														
path	The group ID.   Can be retrieved	path	The device ID.	Facebook OAuth	Google OAuth (China only)	Kispy (China only)	Mobile device	RingCentral OAuth	API user	MeetingId4Recording	meetingId	string	The meeting's universally	query	Specify a value to get the response	enum	past	pastOne	pastMeeting	pastOne	pastUserMeeting					
groupid		deviceid												type	string	live										
string	true	string	true	Phone number (China only)	WeChat (China only)	Microsoft OAuth	Zoom	SSO						string	live											
Mc		Trash		MeetingIdNumber				RecordingId				MeetingTypePast2														
query	Query Metadata of recording if an	query	Query trash, true List recordings	path	string		path	string	query	The type of meeting to query:	enum	live	x-enum-	Past meetings.	MemberId	path	memberId	string								
mc		trash		meetingid	true		recordingid	true																		
string	false	boolean	false																							
MeetingId		RecordingDeleteAction		RecordingDeleteAction				MeetingTypePast3				NextPageToken														
path	integer	query	The meeting's ID. When storing this value in your database,	query	action	enum	trash	enum	delete	x-enum-	delete recording permanently	type	The type of meeting to query +	enum	past	pastOne	Past meetings.	enum	past	pastUserMeeting	NextPageToken	query	The next page token is used	string		
meetingid		meetingid	int64																							
PageNumber		PageSize		Participant				RegistrantId				TransferRecording				WebinarId4Metrics										
query	true	query	integer	path	participant	path	participant	path	registrantId	path	registrantId	query	transfer_recording	transfer_recording	path	userid	The user ID or email address of the	path	webinarid	string	true					
page_number		page_size	30																							
1		300	The number of records returned within a single API call.																							
PageSize4Qos		PageToken		RegistrantStatus				WebinarTypePast				WebinarTypePast2														
query	The number of items returned per	query	The next page token is used to	query	status	string	enum	approved	Registration pending.	Registration approved.	Registration denied.	query	The type of webinar to query:	enum	past	pastWebinar	enum	past	pastWebinars	webinarid	integer	webinarid	true			
page_size	integer	next_page_token																								
1	10																									
SubReseller		TrackingSourceId		TransferEmail				WebinarTypePast2				SessionId														
query	sub_reseller_id	query	tracking_source_id	query	transfer_email	transfer_email	string	boolean	false	query	The type of webinar to query:	enum	past	live	path	sessionId	Chat session ID	path	feedbackid	string						
string		string																								
ToDate		TSPid		TransferMeeting				WebhookId				WebinarUUID														
query	End date.	path	TSP account ID.	query	transfer_meeting	transfer_meeting	boolean	false	path	webhookId	The Zoom room ID.	path	zoomRoomId	path	webinarUUID	string	query	trash_type	string	trash_type						
to	string																									

Figure 2: Within “paths” all setting for “rooms”

/rooms									
<b>get</b> responses 200 **HTTP Status Code** 200 -> A list of Zoom Rooms returned successfully.		tags Zoom Rooms		List Zoom Rooms		listZoomRooms		security 0	
schema object properties page_size integer array List of existing Zoom Rooms.		parameters 0 query status string The status of the Zoom Room.		1 query type Type of the Zoom Rooms.		Zoom Rooms is a software-based room system that provides an integrated experience for audio, video, and content.			
properties id string Unique Identifier of the Zoom Room.		status string Offline Available UnderConstruction Status of the Zoom Room.		enum Offline Available UnderConstruction enum ZoomRoom DigitalSignageOnly		UnderConstruction enum ZoomRoom DigitalSignageOnly		SchedulingDisplayOnly	
name string Name of the Zoom Room.		inMeeting boolean Whether the Zoom Room is currently in a meeting.		inMeeting boolean Whether the Zoom Room is currently in a meeting.		SchedulingDisplayOnly			
room_id string Unique Identifier of the Zoom Room.		location_id string Unique Identifier of the location.		Use this query parameter with a value of 'true' if you would like to see Zoom Rooms in your account that have not been assigned to anyone yet.		The next page token is used to paginate through large result sets. A next page token will be returned whenever the set of available results is exhausted.			
activation_code string Activation Code is the code that is used to complete the setup of the Zoom Room.		globally_unique_id string Globally unique identifier of the Zoom Room. Use this ID for the Dashboard Zoom Room APIs.		2 query unassigned_rooms boolean Whether to include Zoom Rooms that have not been assigned to anyone yet.		4 query next_page_token string The next page token is used to paginate through large result sets. A next page token will be returned whenever the set of available results is exhausted.			
examples application/json 30 rooms 1 187434yewr334 testZoomRooms Available 4ryewr33jfkds eu3435 Sempor Offline MyZoomRooms		3 query page_size 300 The number of records returned within a single API call.		5 query location_id Parent location ID of the Zoom Room.					
1200		integer 30		string					
<b>post</b> responses 201 **HTTP Status Code** 201 -> Created -> Zoom Room added		examples application/json abcdfeffg Cool ZoomRoom SchedulingDisplayOnly 434gf9Gis dhs48287rjf		Add a Zoom Room Use this API to add a Zoom Room (https://support.zoom.us/hc/en-us/articles/20282227)		addARoom tags Zoom Rooms		security 0	
schema object properties id string Unique Identifier of the Zoom Room.		name string Name of the Zoom Room.		location_id string Location ID of the location where the Zoom Room was added.		body body x-examples application/json Cool ZoomRoom SchedulingDisplayOnly 434gf9Gis		required name type string Type of the Zoom Room.	
type string ZoomRoom DigitalSignageOnly SchedulingDisplayOnly Type of the Zoom Room.		room_id string Globally unique identifier of the Zoom Room. Use this ID for the Dashboard Zoom Room APIs.		enum ZoomRoom DigitalSignageOnly SchedulingDisplayOnly Type		400 **HTTP Status Code** 400 -> Bad Request -> Error Code -> 200 -> Zoom Room subscription not found. Try again after purchasing a		404 **HTTP Status Code** 404 -> Not Found -> Error Code -> 4801 -> Location not found:(location_id)	
400 **HTTP Status Code** 400 -> Bad Request -> Error Code -> 200 -> Zoom Room subscription not found. Try again after purchasing a		404 **HTTP Status Code** 404 -> Not Found -> Error Code -> 4801 -> Location not found:(location_id)		429 **HTTP Status Code** 429 -> Too Many Requests -> Error Code -> 132 -> Too many concurrent requests. Try again later.		location_id string **Optional** -> Location ID of the lowest level location in the location hierarchy (https://support.zoom.us/hc/en-us/articles/115000342983) -> Zoom-Rooms-Location-Hierarchy			

The Zoom API is the primary means for developers to access a collection of resources from Zoom. Apps can read and write to the resources and mirror some of the most popular features available in Zoom Web Portal such as creating a new meeting, creating, adding and removing users, viewing reports and dashboards on various usage, and so on using the Zoom API. (Zoom[developer], n.d.a)

While the conception of the API is construed by Zoom as a move toward openness, toward giving access, sharing information, and allowing software to interact with one another, my argument would be that it is the opposite. The API is a designed system in which a cooperation, such as Zoom Video Communications, has complete control of what they share and what they keep hidden from the outside. The API hides how a system works and only shares specific access points by not sharing the entire code or working on an open platform. The API is open only under the conditions of the cooperation controlling the API, a modality of controlled sharing.

Zoom APIs allow developers to request information from the Zoom, including (but not limited) to user details, meeting reports, dashboard data, as well as perform actions on the Zoom platform on a user's behalf. For example, creating a new user or deleting meeting recordings. (Zoom[developer], n.d. c)

In the case of Zoom, the accessibility of the API has two sides: the one keeps internal processes hidden from competitors, outside developers, and the public; the other opens their system toward free labor from developers creating applications for their app store. The API thus becomes a balancing act between sharing and hiding. The equation is simple: *Sharing power to retain power*. By inviting outside developers, Zoom withholds its power from the competition; by growing its platform, by doing much more than “keeping you connected,” Zoom solidifies its power. Simultaneously, the API abstracts the underlying processes for outside usage, only exposing what is necessary.

## Why Study the Zoom API?

The power relation of *sharing to retain power* makes the API an intriguing complex to investigate. The standard setting bar in the GUI of a Zoom conference consists of various buttons. From left to right, the mute button, the start and stop video button, the participant's list, the chat button, the share screen button, the record button, the reaction button, and furthest to the right, the red leave button. Depending on your role and settings, the bar changes and adjusts, restricting and providing access, it consists of five to ten possible operations. In contrast, the current (downloaded on 2021-12-09) Zoom API specification consists of 60,247 nested parameters. While the

API is an abstracted and restricted perspective on an application such as Zoom, one entirely under the company's control, the number of settings, as well as retrievable and postable data exchanges, is immense. Observing the API allows us to study an otherwise disguised system far beyond the graphical user interface. The API provides a perspective on processes hidden from human sight outside the developer's realm.

## The Zoom API Specification Document

What I am investigating throughout the following pages is not the Zoom API itself; instead, what I will observe, visualize, and narrate is the API specification document. Every possible operation of receiving, changing, deleting, posting, or patching data from and to the Zoom API is listed within this file. What is not allowed is forbidden. *Anything outside the specified is unperformable.*

Within this context, Jan Distelmeyer refers to Wendy Chun in this publication. In *Control and Freedom*, Chun argues that Lawrence Lessig's slogan "Code is Law" falls short. Code is not only law but, at the same time, execution (see Chun 2006, 66–67). As long as it is running, the code is simultaneously executing the laws. The separation of powers is not based on a *trias politica* model of a legislature, an executive, and a judiciary. The judiciary of the digital only contains two states: running or failing. There is a small margin of error within the system, that is, the glitch. Outside of that, the legislature "the developer" and the executive "the code" are the two folded systems of power in software infrastructures. The API specification document defines the possibilities for an outside developer to send and receive data with Zoom. *The Laws of Zoom from the perspective of an external developer are written within this documentation.*

The Zoom API reference is made available by Zoom through a web interface (Zoom[developer], n.d. d). In addition to the web documentation, Zoom provides the specification document in one JSON (JavaScript Object Notation) format, a machine-readable version of the document. The entire interaction with the Zoom API is listed within this document in a nested structure consisting of attribute-value pairs and arrays. As an example, 19 lines from the file:

```
"examples": {
  "application/json": {
    "page_size": 30,
    "rooms": [
      {
        "id": "387434ryewr334",
```

Figure 3: Within definitions all UserSettings

UserSettings		in_meeting																																																																																																																																																																																																																														
<table border="1"> <tr><td>schedule_meeting</td><td>boolean</td></tr> <tr><td>UserSettings:Meeting</td><td>boolean</td></tr> <tr><td>properties</td><td>boolean</td></tr> <tr><td>host_video</td><td>boolean</td></tr> <tr><td>audio_type</td><td>enum</td></tr> <tr><td>start_meetings_with_host</td><td>boolean</td></tr> <tr><td>participant</td><td>boolean</td></tr> <tr><td>start_meetings_with_host_before_meeting</td><td>boolean</td></tr> <tr><td>force_pmi</td><td>boolean</td></tr> <tr><td>require_a_password_for_meetings</td><td>boolean</td></tr> <tr><td>use_pmi</td><td>boolean</td></tr> <tr><td>use_personal_meeting</td><td>boolean</td></tr> <tr><td>require_password_for_pmi</td><td>boolean</td></tr> <tr><td>string</td><td>enum</td></tr> <tr><td>enum</td><td>enum</td></tr> <tr><td>meeting_password_requirement</td><td>enum</td></tr> <tr><td>length</td><td>integer</td></tr> <tr><td>consecutive_characters</td><td>enum</td></tr> <tr><td>have_number</td><td>boolean</td></tr> 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    "name": "testZoomRooms",
    "activation_code": "1200",
    "status": "Available"
  },
  {
    "id": "4ryewr33sjfkds",
    "name": "MyZoomRooms",
    "activation_code": "eu34355empor",
    "status": "Offline"
  }
]
}
}

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The JSON document consists of 80.392 nested lines of code; their basic building block is the so-called “key”: “value” pairs. A colon and a value follow the key in double quotes. Commas separate each key/value pair; curly brackets distinguish objects from their nested relations. Square brackets, as in the above example after the key “rooms,” create arrays, storages of multiple pieces of information on the same level of nestedness. Data is structured in hierarchical formations within the JSON format, nested buckets of distinctions. There are only two modes of structure: within and next to.

## Infrastructure Imaging

Various methods can graphically represent hierarchical datasets, such as the Zoom specification document. The visualization for this publication is a rectangular area encoding in which size and position represent the relations of the nested commands. There are only two modes in which rectangles are positioned, placed next to one another and within one another. The artificial tiles of the talking heads of a Zoom interface are reflected and manifested within this data representation. The rectangles recursively subdivide the area; thus, the size of the rectangles represents the number of contained other rectangles. With 80.392 lines of code, the entire structure of the API specification document is representable with one symbol: the rectangle. The relations of the rectangles to one another are, like the data, twofold: within and next to. The four lines that constitute the rectangle define what is included and what is excluded. There are no overlaps; everything is perfectly expressed in stacked boxes, mirroring the definedness of the Zoom video tiles.

The first layer of stacked tiles within the API document consists of 13 objects: x-stoplight, swagger, info, host, basePath, schemes, consumes, produces, paths, pa-

rameters, definitions, tags, securityDefinitions, security. The quantities of nested structures within these terms vary tremendously. While “paths” contain 42,461 key/value pairs, others such as “x-stoplight,” “swagger,” “host,” or “security” only contain one key/value pair.

Within the “parameters” key, 375 key/value pairs are nested (fig. 1). It is the third-largest set after “paths” (42,461 pairs) (fig. 2 & 4) and “definitions” (17,278 pairs) (fig. 3, 5, & 6). Within “parameters,” for example, the “AccountId” and the “DeviceId” are stored. From the data, we can observe some of Zoom’s constraints. For example, there are 12 different Login Types for Zoom. A user can log in to Zoom using the authorization protocol OAuth, using Facebook, Apple, Microsoft, and RingCentral, or by Mobile device, the API, a Zoom Work email, and Single Sign-On. In addition, Chinese Users can sign in by Phone number, WeChat, and Alipay. The entirety of possible login modes for users are listed within the document. What is not allowed is forbidden. But what is similarly intriguing is that the API documentation states all possibilities, even if they only apply to specific users, in this case, Chinese Users. Particular settings are only visible to specific users on the user interface level. *Within the API, all accessible operational potentialities must be defined.*

The API manual does not further define the logging in through Facebook; there are no details on the process or the data exchanged. Throughout the entire document, “Facebook” is mentioned 151 times. I am commenting on this as there have been some suspicious activities between the two services. An analysis published on March 26<sup>th</sup> 2020, by Vice’s online magazine *Motherboard* (Cox 2020) found that Zoom sends data to Facebook’s graph API upon using the iOS app. Zoom exchanged information about the used device, the phone carrier, location, and a unique advertising identifier, among others, with Facebook. Such an operation would have happened not through the public API but through Facebook’s Software Development Kit for iOS. Six days after the Vice publication on April 1st, 2020, the CEO of Zoom, Eric S. Yuan, apologized for the data exchange and removed the possibility to log in on iOS through Facebook (Yuan 2020).

The Zoom API documentation is the law and executive manuscript for outside developers. Simultaneously as exemplified in the example with Facebook, outside of that law, Zoom can establish other exchanges. The Laws of the Zoom API documentation are far from universal. They are only defined for the specific use-cases of external developers building applications within the Zoom platform. That said, establishing an ethical commitment that all possible data exchanges are contained within an open API would be a tremendous step toward a more transparent relationship between users and their services. The Zoom Facebook exemplification shows how far we are from such a reality. The public Laws of Zoom only render visible what the company wants to be visible.





In researching computational systems, Frieder Nake suggested a differentiation between the surface, the visual graphic interface, and the subface, the underlying process, the algorithmic thing, making the surface visible (2015). The API is one layer of the subface—the processes hidden from view, the data exchanges occurring once you click the Zoom button without notice. The graphic representations of this paper turn parts of the subface into the surface—visualization as the alchemy of concealed operations. The subface of Zoom through the lens of the API specification document is at times strikingly similar to the interactions one has while using Zoom and at other times uncanny and distant. The specification document maps out the possibility space rather than actualities. It does not show what is but what is possible within the operational space for external developers.

Zoom's graphic user interface tiles, the talking heads, the arranged tiled structure, and the undercomplexity at which Zoom aestheticizes human interactions are also reflected in the orderings of Zoom's developer realities. The two-fold mechanism of next to and within reveals a facile worldview of a two-fold arrangement of reality. Simultaneously, the simple structure of the notation object overwhelms by scale. This observation divulges something fundamental about the complex, hidden behind the term "digital": Simple conceptions with few mechanics are scaled into feigned complexity. For a computer, it makes little difference whether there are 10, 100, 1,000, or 10,000 nestings. As long as the mechanics are constant, the quantity is secondary. Within the physical realities we inhabit, this is not the case. Repetition takes time and effort. The same is true about the observation of the graphic representations of the Zoom API. The number of rectangles is computed within milliseconds, but reading and comprehending these structures strongly depends on the amounts of represented dependencies. However, a discrepancy, an omission of a bracket, a change in the relationship between elements, or a missing comma would render the system incalculable. Quantities within hardware limits hardly make a difference in the system, but a conceptual difference breaks the system immediately. Remove one sign, and the file renders computationally illegible. Size and conceptual complexity are two dimensions that are diametrically opposed within the term digitality.

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