



# Demystify Graph And Graph Technologies



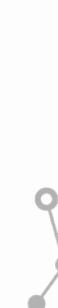
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Carl Boudreau | Senior Learning & Development Trainer

KGC 2022, May 5, 2022

TUTORIAL

## Demystify Graph And Graph Technologies



TigerGraphDB





Advanced Analytics and Machine Learning on Connected Data

Get started free at [www.tigergraph.com/get-tigergraph](http://www.tigergraph.com/get-tigergraph)

## Carl Boudreau

Senior Learning & Development Trainer

Ogilvie, Minnesota, United States · 500+  
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TigerGraph



College of the Albemarle



Websites

## About

Experienced Software Architect/Developer with a demonstrated history of working in the computer software industry. Skilled in Machine Learning, Artificial Intelligence, Augmented Reality, Python, C#, Databases Visual Studio, Anaconda, IntelliJ. Strong engineering professional a demonstrated history of delivering solutions from cradle to grave that meets or exceeds customer expectation.

[training@tigergraph.com](mailto:training@tigergraph.com)

22 Years in Software Development

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<https://www.linkedin.com/in/graphy-giraffe/>

# Agenda - Demystify Graph And Graph Technologies

1. Graph vs. RDB & Key Value Stores
2. What are Vertices and Edges
3. Schema thinking in Graph vs RDB
4. Hands On

# Create an account at:

<https://www.tgcloud.io>



# Get the data at:

<https://drive.google.com/drive/folders/1S6P6W-S1pwLcQ4ktueVdupYK>



# Graph vs. RDB & Key Value Stores

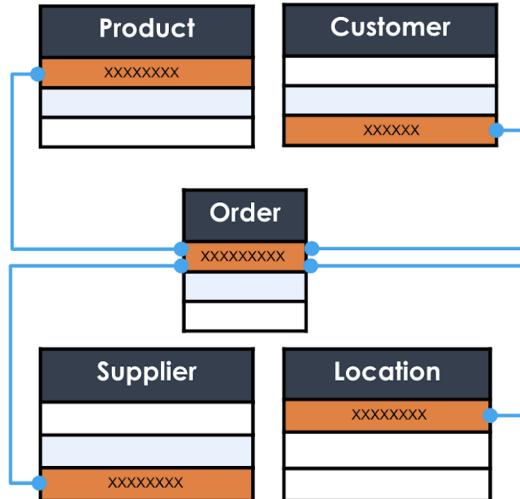


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# What are Graph Databases?

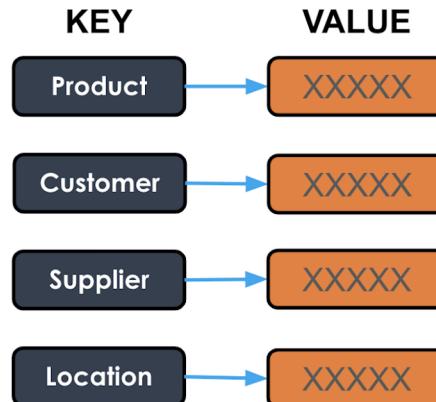


Relational Database

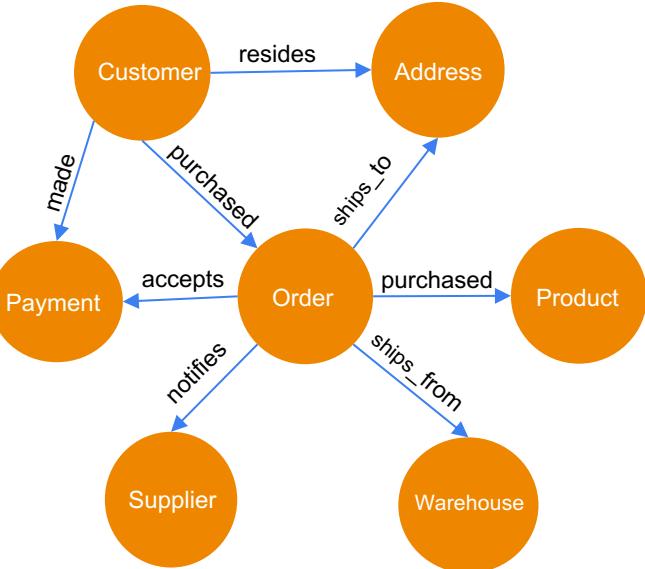


- Rigid schema
- High performance for transactions
- Poor performance for deep analytics

Key-Value Database



- Highly fluid schema/no schema
- High performance for simple transactions
- Poor performance deep analytics



- Flexible schema
- High performance for complex transactions
- High performance for deep analytics



AutoSave OFF

Home Insert Draw > Tell me Share Comments

Possible Data Loss Some features might be lost if you save th...

users

A	B	C	D	E	F	G
1 id	email	username	name	join_date		
2 1	mgeistmann@mgeistmann	Marvin Geist	9/30/18			
3 2	hchapple1@hchapple1	Hermia Chap	5/31/21			
4 3	lvowels2@elvowels2	Laird Vowels	10/26/20			
5 4	dadelberg3@dadelberg3	Deeanne Ade	9/20/19			
6 5	pdarter4@pdarter4	Dorelle Parge	8/23/19			
7 6	pbrecken5@pbrecken5	Pam Brecker	9/21/18			
8 7	vbarracks6@vbarracks6	Virgie Barrack	2/9/21			
9 8	tguiness7@tguiness7	Thornton Gu	4/24/21			
10 9	aoverington8@aoverington8	Abner Overin	4/17/21			
11 10	mamberger9@mamberger9	Mead Amber	11/18/19			
12 11	vgerransa@vgerransa	Vaughn Ger	4/24/19			
13 12	nkinklock@c nkinklockb	Nathaniel Kink	6/3/21			
14 13	tmozzic@w1 tmozzic	Tommi Mozz	12/26/19			
15 14	sawtond@csawtond	Sherm Dawt	5/3/20			
16 15	croslene@xi croslene	Chic Roslen	4/17/19			
17 16	lmcaneyf@lmcaneyf	Lynn McAner	7/7/18			
18 17	smulfordg@ smulfordg	Sandor Mulf	4/26/21			
19 18	jcullumh@o jcullumh	Jodie Cullum	9/8/20			
20 19	nphebey@b nphebey	Noah Phebey	8/19/19			
21 20	twonfar@m twonfarj	Tucker Wonf	3/25/20			
22 21	jthoulessk@jthoulessk	Jasun Thoule	4/17/20			
23 22	bducastell@ bducastell	Bartie Ducas	4/13/19			
24 23	ercent-Tek@ercent-Tek	Ercent Tek	2/25/21			

AutoSave OFF

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Possible Data Loss Some features might be lost if you save this workbook in the...

posts

A	B	C	D	E	F	G	H	I	J
1 id	content	posted_date	by_user	deleted	hashtag_1	hashtag_2	hashtag_3	hashtag_4	
2 1	Proin interdu	8/4/19	69	FALSE	Compatible	Organized			
3 2	Praesent bla	5/1/20	52	FALSE	system-wort	4th generation			
4 3	Vestibulum c	3/10/21	33	FALSE	interface				
5 4	Nam nulla. It	4/30/21	83	FALSE	De-engineer	budgetary	Expanded	secured line	
6 5	Maecenas ti	2/4/20	83	TRUE	adapter	Mandatory			
7 6	Cras pellent	2/22/21	36	FALSE	static	matrix	Centralized		
8 7	Suspendisse	8/29/19	47	FALSE	Reduced	projection	Triple-buffered		
9 8	Morbi quis tc	8/23/20	46	FALSE	Ameliorated		Self-enabling	Future-proofed	
10 9	Duis bibendum	12/17/20	74	FALSE	impacting		Stand-alone		
11 10	Aenean lectu	2/27/20	31	FALSE	incremental	solution-oriented			
12 11	Morbi a ipsu	12/15/20	88	TRUE	Multi-lateral	Enterprise-w	Networked	Customizable	
13 12	Suspendisse	7/31/20	7	FALSE	synergy	solution-ori	methodology		
14 13	Phasellus sit	6/15/20	69	FALSE	eco-centric	benchmark			
15 14	Cum sociis n	8/6/20	92	FALSE	6th generati	system-wort	middleware		
16 15	Vestibulum s	7/7/20	12	FALSE	Cross-group	strategy	encryption	capability	

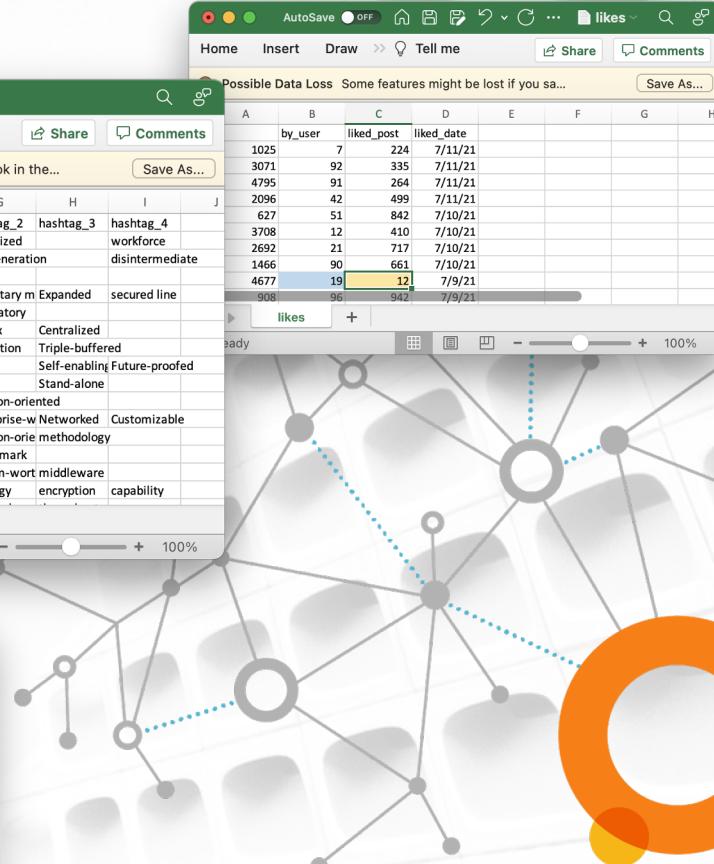
AutoSave OFF

Home Insert Draw > Tell me Share Comments

Possible Data Loss Some features might be lost if you save this w...

messages

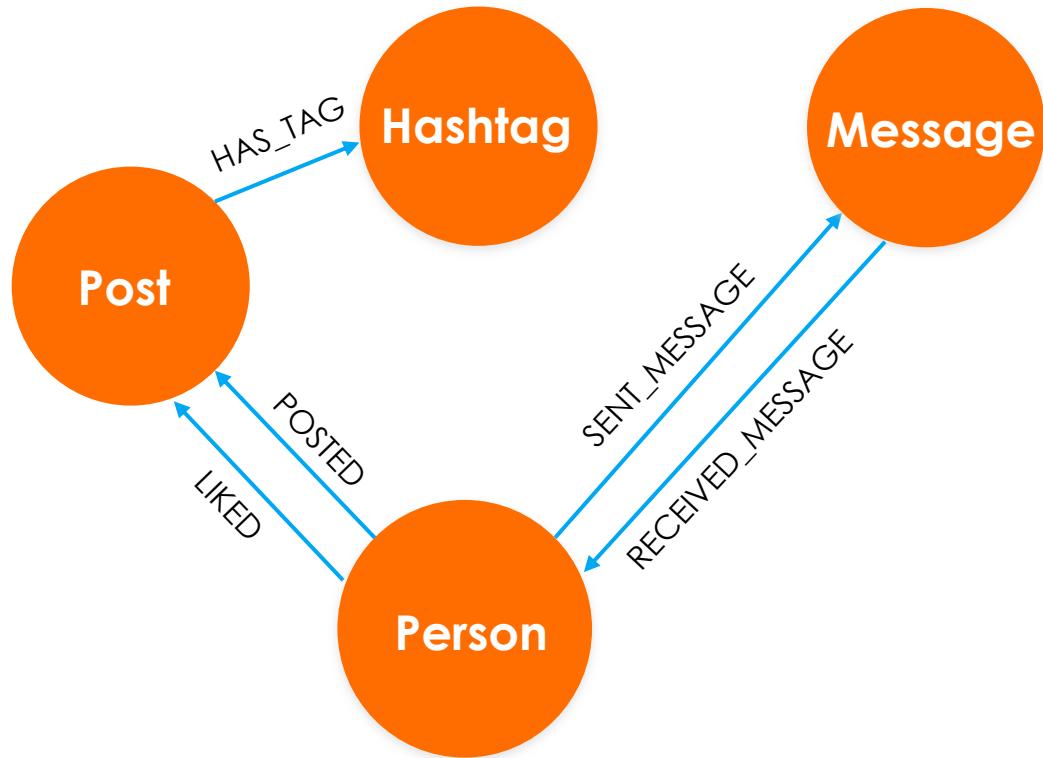
A	B	C	D	E	F	G	H
1 id	body	subject	by_user	to_user	send_date	read_date	
2 516	Cras non vell	Donec diam	7	19	7/3/18	7/6/18	
3 401	Phasellus in	Quisque id ju	19	7	7/3/18	7/16/18	
4 272	Proin risus. P	Morbi non qu	92	4	7/4/18	7/11/18	
5 539	Nulum variu	In hac habita	52	40	7/6/18	7/31/18	
6 540	Nullam sit ai	In hac habita	6	92	7/10/18	8/14/18	
7 941	Aenean aut	Suspendisse	40	15	7/13/18	7/20/18	
8 322	Cum sociis n	Fusce lacus f	81	76	7/14/18	8/12/18	
9 5477	Morbi ut odio	Cras pelle	52	17	7/14/18	7/15/18	
10 677	Donec ut ma	Nam dui.	97	57	7/14/18	8/5/18	
11 698	How is the n	Suspendisse	91	75	7/14/18	7/25/18	
12 290	Integer non \	Donec ut ma	9	60	7/14/18	7/30/18	



# What are Vertices and Edges



# Vertices & Edges





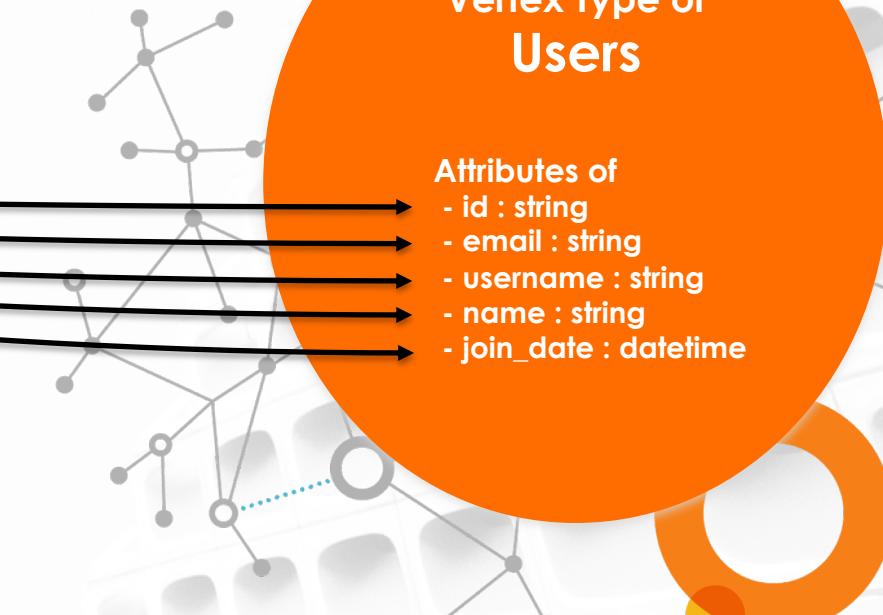
AutoSave OFF Home Insert Draw Tell me users Share Comments

Possible Data Loss Some features might be lost if you save th... Save As...

A	B	C	D	E	F	G	H
1	id	email	username	name	join_date		
2	1	mgeermann	mgeermann	Marvin Geist	9/30/18		
3	2	hchap@01.hchartool	Holiday Chap		5/1/21		
4	3	ivowe	2@elbowwits2	Lain Vowels	10/6/20		
5	4	dadelberg3	dadelberg3	Deanne Adel	9/0/19		
6	5	dpregeter	dpregeter4	Dominique Pregeter	4/1/19		
7	6	pbrecken5	pbrecken5	Pam Brecken	9/1/18		
8	7	vbaracks6	vbaracks6	Vince Barrack	2/9/21		
9	8	tguiness7	tguiness7	Thornton Guiness	4/19/21		
10	9	aoverington8	aoverington8	Abree Overir	4/17/21		
11	10	mamberger9	mamberger9	Mead Amber	11/18/19		
12	11	vgerransa10	vgerransa	Vaughn Ger	4/24/19		
13	12	nkinklockb11	nkinklockb	Nathaniel Kink	6/3/21		
14	13	tmozzic@12.tmozzic	Tommi Mozz	12/26/19			
15	14	sawtond13	sawtond	Sherm Dawt	5/3/20		
16	15	croslene14	croslene	Chic Roslen	4/17/19		
17	16	lmcaneyf15	lmcaneyf	Lynn McAney	7/7/18		
18	17	smulfordg16	smulfordg	Sandor Mulf	4/26/21		
19	18	jculumh@17.jculumh	jculumh	Jodie Culum	9/8/20		
20	19	nphебей@18.nphебей	nphебей	Noah Phebej	8/19/19		
21	20	twonfarj@21.mtwonfarj	twonfarj	Tucker Wonf	3/25/20		
22	21	jthoulessk@22.jthoulessk	jthoulessk	Jasun Thoule	4/17/20		
23	22	bducastell@23.bducastell	bducastell	Bartie Ducas	4/13/19		
24	23	eswartzsch@24.eswartzsch	eswartzsch	Ernest Swartzsch	2/25/21		

## Vertex Type of Users

- Attributes of
- id : string
  - email : string
  - username : string
  - name : string
  - join\_date : datetime



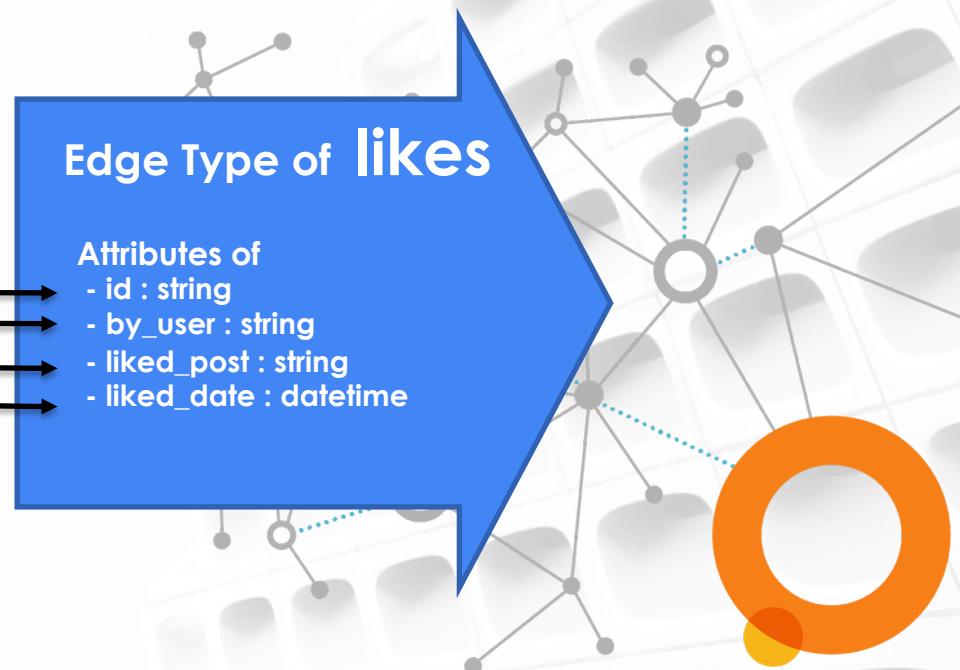


	A	B	C	D	E	F	G	H
1	id	by_user	liked_post	liked_date				
2	1025	7	224	7/11/21				
3	3071	92	335	7/11/21				
4	4795	91	264	7/11/21				
5	2096	2	499	7/11/21				
6	627	51	842	7/11/21				
7	3708	12	410	7/11/21				
8	2652	21	717	7/11/21				
9	1466	96	654	7/11/21				
10	4677	19	7	7/11/21				
11	908	96	942	7/11/21				

## Edge Type of likes

### Attributes of

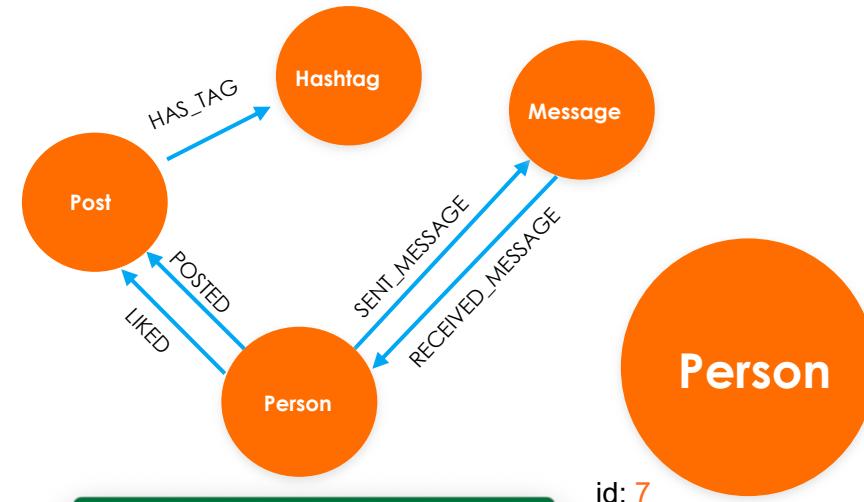
- id : string
- by\_user : string
- liked\_post : string
- liked\_date : datetime



# Property Graphs – Types and Properties



# Property Graphs – Types and Properties



id: 7

email: vbarracks6@utexas.edu  
 username: vbarracks6  
 name: Virgie Barracks  
 join\_date: 2021/09/02

A	B	C	D	E	F	G	H
1	id	email	username	name	join_date		
2	1	mgeistmann@mgeistmann	Marvin Geist	9/30/18			
3	2	hchapelot@hchapelot	Henriette Chap	5/31/21			
4	3	lvovets2@el_lvovets2	Elizaveta Lvovets	10/20/20			
5	4	ddalderup@ddalderup3	Deanne Ad	7/20/19			
6	5	dspngster4@dspngster4	Dorelle Parpi	8/23/19			
7	6	pbnckens@pbnckens	Pam Brecker	9/21/18			
8	7	vbarackst@vbarackst6	Virgie Barracks	2/9/21			
9	8	tpaines7@tpaines7	Thornton Gui	4/24/21			
10	9	avoreringt@avoreringt	Abner Overir	4/17/21			
11	10	mamberger@mamberger5	Mead Ambre	11/19/19			
12	11	vgerarasa@vgerarasa	Vaughan Geri	4/24/19			
13	12	nklockkb@c_nklockkb	Nathaniel Kli	6/3/21			
14	13	tmozzic@w1_tmozzic	Tommi Mozz	12/26/19			
15	14	sdawtond@sdawtond	Sherm Dawti	5/3/20			
16	15	croslene@x1_croslene	Chic Roslen	4/17/19			
17	16	lmcaneynf@lmcaneynf	Lynn McAner	7/7/18			
18	17	smulfordg@smulfordg	Sandor Muffi	4/26/21			
19	18	jculumh@oocjculumh	Jodie Culum	9/8/20			
20	19	nphebey@b_nphebey	Noah Phebe	8/19/19			
21	20	twonfarj@m twonfarj	Tucker Wonf	3/25/20			
22	21	jhoulesss@jhoulesss	Jasun Thoule	4/17/20			
23	22	bducastell@bducastell	Bartie Ducas	4/13/19			

A	B	C	D	E	F	G	H	I	J
1	id	content	posted_date_by_user	deleted	hashtag_1	hashtag_2	hashtag_3	hashtag_4	
2	1	Proin interdu	8/4/19	69	FALSE	Compatible	Organized	workforce	
3	2	Praesent bla	5/1/20	52	52	4th generation			
4	3	Vestibulum e	3/10/21	33	33	interface			
5	4	Nam nulla. Ii	4/30/21	83	83	De-engineer	budgetary m	Expanded	
6	5	Maecenas tii	2/4/20	83	TRUE	adapter	Mandatory	secured line	
7	6	Cras pellente	2/22/21	36	36	status	matrix	Centralized	
8	7	Suspendisse	8/29/19	47	47	Reduced	projection	Triple-buffered	
9	8	Morbi quis t	8/21/20	46	46	Ameliorated		Self-enabling	
10	9	Duis bibendum	12/25/20	74	74	Future-proofed		Future-proofed	
11	10	Aliquam lecte	3/27/20	31	31	incremental	solution-oriented	Stand-alone	
12	11	Morbi a ipsu	12/15/20	88	88	Multi-lateral	Enterprise-w	Networked	
13	12	Suspendisse	7/31/20	7	7	synergy	solution-ori	Customizable	
14	13	Phasellus sit	6/15/20	69	69	eco-centric	benchmark		
15	14	Cum sociis n	8/6/20	92	92	6th generali	system-wor	middleware	
16	15	Vestibulum s	7/7/20	12	12	Cross-group	strategy	encryption	

Liked

id: 1025

by\_user: 19

liked\_post: 12

liked\_date: 2021/07/11

Post

id: 12

content: Suspendisse ornare ....

posted\_date: 2020/07/31

posted\_by: 7

deleted: False

A	B	C	D	E	F	G	H
1	id	by_user	liked_post	liked_date			
2	1025	7	224	7/11/21			
3	3071	92	335	7/11/21			
4	4795	91	264	7/11/21			
5	2096	42	499	7/11/21			
6	627	51	842	7/10/21			
7	3708	12	410	7/10/21			
8	2692	21	717	7/10/21			
9	1466	90	661	7/10/21			
10	4677	19	12	7/9/21			
11	508	96	942	7/9/21			

# Thinking in Graph vs RDB

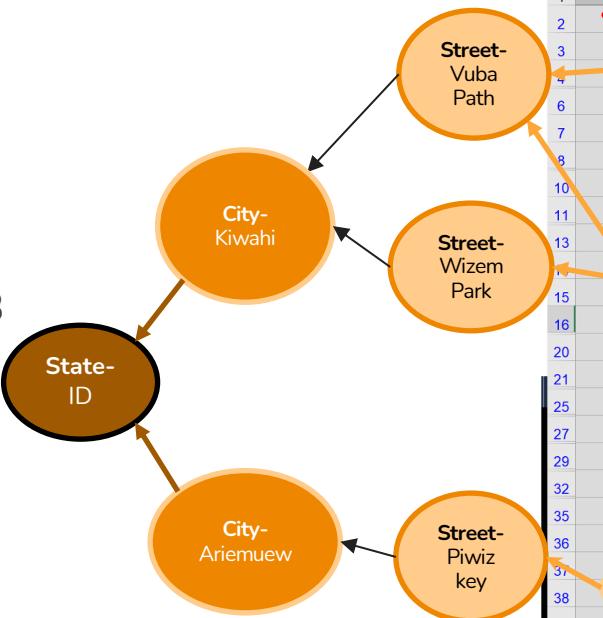


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# Data Normalization

1. The state of “ID” is a Data Object that is stored 58 times on disk.
2. The city of “Kiwahi” is a Data Object that is stored 3 times

In Graph, “ID” & “Kiwahi” is stored ONCE (in this design.)

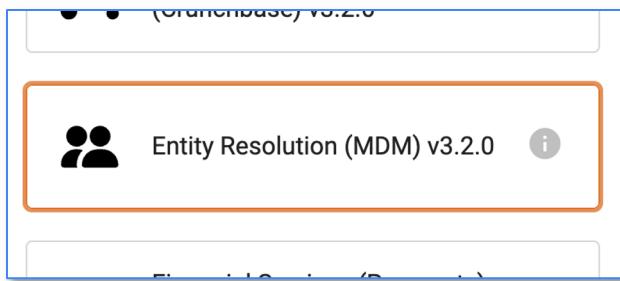


Graph Scheme Design MATTERS!

AutoSave On UserDataSet - Saved

P16	A	B	C	D	E	F	G	H	I	J
1	Id	first	last	street	city	state	zip	dob		
2	1	Lee	Yates	Vuba Path	Kiwah	ID	44714	1979-10-16		
3	2	Derrick	Ramos	Lavezi Parkway	Ariemuew	ID	44714	1985-04-07		
4	3	Orville	Lee	Lee Vuba	Place	Lewivulu	ID	44714	1985-05-12	
5	5	Beatrice	Lee	Lee Vuba	Path	Kiwah	ID	44714	1985-10-09	
6	6	Jacob	Mullins	Ducip Street	Ariemuew	ID	44714	1986-01-06		
7	7	Jordan	Reed	Virnaj Glen	Lewivulu	ID	44714	1986-11-09		
8	9	Rebecca	McKinney	Melu Terrace	Rawdoiz	ID	44714	1987-05-28		
10	10	Devin	Reed	Virnaj Glen	Lewivulu	ID	44714	1987-06-05		
11	12	Billy	Perkins	Vohuv Key	Ariemuew	ID	44714	1989-06-20		
13	13	Bernice	Perkins	Vohuv Key	Ariemuew	ID	44714	1990-03-30		
14	14	Darlene	Floyd Stephens	Wizem Park	Kiwah	ID	44714	1990-04-08		
15	15	Agnes	Floyd Stephens	Wizem Park	Kiwah	ID	44714	1990-04-28		
16	19	Floyd	Stephens	Wizem Park	Kiwah	ID	44714	1991-03-14		
20	20	Edgar	Reed	Dofot Terrace	Lewivulu	ID	44714	1991-04-27		
21	24	Pauline	Mathis	Gezpo Mill	Rawdoiz	ID	44714	1991-12-27		
25	26	Dorothy	Murray	Lavezi Parkway	Ariemuew	ID	44714	1992-06-19		
27	28	Derrick	McKinney	Melu Terrace	Rawdoiz	ID	44714	1992-10-25		
29	31	Sadie	Perkins	Vohuv Key	Ariemuew	ID	44714	1993-03-11		
32	34	Rosalie	Stephens	Wizem Park	Kiwah	ID	44714	1993-11-06		
35	35	Mittie	Ramos	Piwi Key	Ariemuew	ID	44714	1993-11-08		
36	36	Mittie	Ramos	Piwi Key	Ariemuew	ID	44714	1993-12-04		
37	37	Ellen	Yates	Asuori Center	Lewivulu	ID	44714	1994-05-24		
38	38	Ellen	Yates	Asuori Center	Kiwah	ID	44714	1994-08-15		
39	2	Garrett	Murray	Lavezi Parkway	Ariemuew	ID	44714	1995-06-30		
40	3	Walter	Ramos	Piwi Key	Ariemuew	ID	44714	1995-10-12		
41	7	Noah	Mullins	Ducip S	Ariemuew	ID	44714	1997-11-17		
42	9	Chad	Mathis	Edo	Ariemuew	ID	44714	1998-04-19		
43	12	Iva	Sanchez	Asuori C	Lewivulu	ID	44714	1999-09-28		
44	14	Ellen	Yates	Vuba Path	Kiwah	ID	44714	2000-09-12		
45	16	Luis	McKinney	Melu Terrace	Rawdoiz	ID	44714	2001-09-04		
46	17	Gavin	Sanchez	Asuori Center	Lewivulu	ID	44714	2001-11-01		
47	18	Frederick	Mullins	Ducip Street	Ariemuew	ID	44714	2001-12-15		

# Hands On. - MySocial



KGC 2022, May 5, 2022



# TigerGraph University

Welcome to TigerGraph University  
where your enablement journey  
begins!

Use TigerGraph University to explore on-demand training and certification exams. This material will help you in getting started and using TigerGraph efficiently and effectively.

Please complete this welcome course to unlock all available content.



The screenshot shows the TigerGraph University landing page. At the top, there's a navigation bar with the TigerGraph logo, a dropdown menu for 'TigerGraphUni...', and a 'Learn' button. A 'Return to LMS' link is in the top right corner. Below the header, there's a sidebar with a 'Welcome to TigerGraph University' video thumbnail (labeled '100% COMPLETE') and a 'TigerGraph University' section. The main content area is titled 'Lesson 1 of 1' and 'TigerGraph University'. It features a large image of a person in a suit holding a tablet displaying a glowing graph visualization. Below the image, the text reads: 'Welcome to TigerGraph University where your enablement journey begins!'. To the right of the image, there's a section titled 'What is TigerGraph?' which contains a detailed description of the platform and its applications. At the bottom right of the main content area, it says 'TigerGraph - The Age of Graph'.

# TigerGraph's Developer Community

TigerGraph's Developer Community is here for you every step of the way. No matter how trivial or small a question might be we would love for you to join and ask us in the Forums or in our Community Chat.

You will find other TigerGraph developers from all over the world that understand the barriers of learning new technologies who are eager to help you on your Tigergraph Journey

The screenshot shows the homepage of the TigerGraph Developer Community forum. At the top, there is a navigation bar with the TigerGraph logo, "Developer", "LIBRARY", "COMMUNITY", and "DOCS". Below the navigation bar is a search bar and a user icon. The main content area features a large "Home" icon. Below it are buttons for "all categories", "all tags", "Latest", "New (5)" (which is highlighted in orange), "Top", and "Categories". To the right of these buttons are links for "+ New Topic" and "Dismiss New". Further down, there are sections for "Topic" and several posts. The first post is titled "Failed to convert user vertex id for parameter error" and is attributed to "TG-Cloud" and "tigercloud". The second post is titled "Irregular consumption of ram for gpe" and is attributed to "TigerGraph Platform". The third post is titled "About the Welcome category" and is attributed to "Welcome". The fourth post is titled "About the About the Community category" and is attributed to "About the Community", "announcements", "forum\_feedback", "weekly\_updates", and "introductions". On the right side of the page, there is a QR code with the TigerGraph logo in the center.

all categories ► all tags ► Latest **New (5)** Top Categories

+ New Topic ✓ Dismiss New

Replies Views Activity

Topic

Failed to convert user vertex id for parameter error  
TG-Cloud tigercloud

Irregular consumption of ram for gpe  
TigerGraph Platform

About the Welcome category  
Welcome

About the About the Community category  
About the Community announcements forum\_feedback weekly\_updates introductions



[training@tigergraph.com](mailto:training@tigergraph.com)



Questions?



**TUTORIAL**

**Demystify Graph And  
Graph Technologies**



Join us for the #KGConference  
**MAY 2-6**  
Live In Cornell Tech  
& Globally Online

