[Course Overview](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live" \t "psplayer)

[Course Overview](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live)

[Hi, my name is Vitthal Srinivasan, and I'd](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=0) [like to welcome you to this course on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=8.268111111111113) [Creating and Administering Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=10.067333333333334" \t "psplayer) [Spanner Instances. A little bit about](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=12.569) [myself first. I have Masters degrees in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=15.529) [financial, math, and electrical](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=18.38) [engineering from Stanford University and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=19.947999999999997) [have previously worked in companies, such](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=22.0112) [as Google in Singapore and Credit Suisse](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=24.306) [in New York. I am now co-founder at](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=26.801555555555556) [Loonycorn, a studio for high-quality video](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=29.63" \t "psplayer) [content based in Bangalore, India.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=32.889) [Relational databases have traditionally](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=35.119) [relied on vertical scaling, but Google's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=37.069) [Cloud Spanner is carefully architected to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=40.190999999999995) [provide horizontal scaling and global](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=42.688599999999994) [replication with all of the rigors of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=45.119) [strong consistency. In this course, you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=48.114000000000004) [will gain the ability to identify](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=50.33950000000001) [situations when Spanner is indeed the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=52.193000000000005) [right tool for you to choose and then](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=54.670111111111105) [correctly design your data and configure](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=57.564499999999995) [your instance to get the best out of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=59.579125) [Spanner's formidable capabilities. First,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=62.5715) [you will learn exactly where Cloud Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=64.81328571428571) [fits in the suite of GCP storage](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=67.27775) [technologies and how it compares to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=70.069) [BigQuery, Cloud SQL, and others. Spanner,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=72.272" \t "psplayer) [like Cloud SQL, is an RDBMS service on the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=76.11328571428571) [GCP, which means that it guarantees the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=79.72962500000001) [ACID properties of atomicity, consistency,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=82.05559999999998) [isolation, and durability. However,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=84.97833333333332) [Spanner differs from Cloud SQL in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=88.08) [important ways. Cloud SQL supports MySQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=90.38250000000004) [and Postgres, but Spanner is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=93.196) [Google-proprietary. Cloud SQL is regional,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=96.53725) [where Spanner can be configured to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=98.44999999999999) [replicate globally. Next, you will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=100.87950000000001) [discover Spanner's data model and how it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=103.049) [enables horizontal scaling. Here the key](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=105.75128571428573) [is the concept of a split, which can be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=107.95166666666668)[thought of as a group of rules from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=110.243) [related tables that can be moved around](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=112.02971428571428) [independently by the platform. The idea of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=114.6218) [physically storing data from different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=118.106) [tables together is called interleaving,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=119.9838) [and this is a key driver of the design and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=122.194) [architecture of Cloud Spanner. Finally,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=125.79614285714285) [you will explore how to use Spanner in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=127.95785714285715) [conjunction with other GCP services,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=130.49033333333333) [notably Dataflow templates for migrating](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=132.4808) [data into Spanner. Spanner was developed](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=135.228) [for use within Google several years before](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=138.4422857142857) [it was made publically available.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=141.00687499999998) [Consequently, the migration path into](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=142.805) [Spanner was not quite clear initially.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=144.685) [However, with the addition of Google-](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=146.719) [supported Dataflow templates, that concern](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=148.248) [has been substantially addressed. When](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=151.045)[you're finished with this course, you will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=153.13066666666668) [have the skills and knowledge of Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=154.664) [Spanner needed to architect solutions to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=156.53566666666666) [problems that require global replication,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=159.247) [strong consistency, and horizontal scaling in an RDBMS.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=cfc57c63-84a7-4328-b9f2-21cc1e01079a&clip=0&mode=live&start=161.40566666666666)

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Cloud Spanner is a proprietary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=11.758999999999997) [Google RDBMS. It is a globally distributed](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=15.106) [product in contrast to Cloud SQL, which is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=18.445285714285706) [the other RDBMS offering on the Google](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=21.363000000000007) [Cloud Platform. Cloud SQL is regional;](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=24.329285714285714) [Cloud Spanner is global. Spanner is also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=27.718499999999995) [an important offering because it is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=31.3505) [horizontally scaled. Again, this makes it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=34.291999999999994) [different from many other traditional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=36.61057142857143) [RDBMS products, including Cloud SQL, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=38.550000000000004) [focus on vertical scaling. The defining](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=41.11366666666666) [characteristic of an RDBMS is typically](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=44.423857142857145) [support for transactions and support for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=47.202) [the ACID properties. In this context,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=50.1888)[Spanner offers very strong consistency](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=52.7987142857143) [guarantees, which can be part of as](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=54.66316666666667) [ACID++. Cloud Spanner is pretty](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=57.35657142857143) [cutting-edge technology. It is also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=60.213)[relatively expensive. It was only made](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=62.98380000000001) [available for use on the Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=65.05877777777778) [Platform in early 2017, so it's very new](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=67.61166666666666) [and really very cutting-edge. Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=71.87150000000003) [Spanner is a great RDBMS offering for some](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=74.1135) [specific use cases, and we will discuss](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=77.01042857142858) [its advantages and some of its limitations in the course coming up ahead.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=0&mode=live&start=79.50071428571428)

[Prerequisites and Course Outline](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live)

[Let's start with a look at the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=0.909) [prerequisites and an outline of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=2.9407499999999995) [course. Here are some of the skills and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=5.1585) [software, which you'll find important if](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=7.1828749999999975) [you are to derive maximum benefit from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=8.770125000000002) [this course. You probably need to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=11.610666666666667) [understand cloud computing at a very basic](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=13.844999999999999) [level. This is not to say that you need to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=16.533333333333335) [be an expert on the Google Cloud Platform](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=18.193454545454554) [or anything like that, but you need to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=20.23742857142858) [have a rough idea of how cloud computing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=22.616444444444447) [works and what, for instance, a cloud VM](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=25.9975) [instance is or a cloud storage bucket is.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=29.763999999999992) [That level of knowledge is pretty](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=32.513) [important. It also will be important for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=35.13757142857141) [you to know and understand concepts from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=37.15900000000002) [relational database management. If you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=39.88540000000001) [have no idea about what a transaction is,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=42.60999999999999) [or if you've never heard the term ACID](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=44.64942857142857) [properties, this course might be a little](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=47.343285714285706) [steep for you. It will help for you to be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=50.54400000000001) [familiar with SQL queries, at least very](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=53.529222222222245) [basic ones. If you've worked with an open](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=56.64014285714286) [source RDBMS technology, like MySQL or](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=59.87600000000001) [Postgres, that's perfect in particular](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=62.63740000000001) [because Cloud SQL, which is the plain](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=64.93066666666667)[vanilla RDBMS offering on the Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=68.36371428571428) [Platform supports these two flavors. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=71.16583333333335) [case you're a bit light on this material,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=74.33337499999999) [here are a couple of prereqs that might](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=76.49687499999999) [help. The first of these is Creating and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=78.82987499999999) [Administering Google Cloud SQL Instances.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=82.05916666666667) [The second is Architecting Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=84.63)[Storage Configurations. Both of these](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=86.647) [courses are available on Pluralsight.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=90.31624999999998) [They've been authored by my colleague,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=91.985) [Janini Ravi. So you might want to check](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=93.812" \t "psplayer) [them out, particularly if you're a little](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=96.566) [light on the prerequisite knowledge, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=98.597) [we just discussed a moment ago. Let's turn](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=101.14271428571429) [now to a look at the outline of this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=104.016) [course. We begin with a look at why you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=107.19930000000004) [might choose Cloud Spanner, its features,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=109.5192222222222) [limitations, and pricing, and a comparison](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=112.307) [to other GCP technologies. Then we'll move](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=115.041) [on to creating Cloud Spanner instances and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=117.9337142857143) [the mechanics of working with interleaved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=120.3905)[tables and accessing Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=123.05219999999998) [programmatically. And we'll round out the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=126.22500000000001) [course with a look at how Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=128.475) [integrates with other services, notably](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=130.36100000000002)[Dataflow, Cloud Functions, and Storage](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=133.0463333333333) [Buckets. This is a particularly important](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=136.18360000000004) [part of the course. Because of how new and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=138.4578571428571) [how cutting-edge Spanner is, it can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=141.36412499999992) [sometimes be a challenge to get Spanner to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=143.83200000000002) [work with other GCP services, and it can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=146.69411111111114) [sometimes be a challenge to migrate data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=149.48675000000003)[into Spanner. We'll try our best to allay](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=152.43742857142857) [and assuage some of these concerns towards](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=155.25425000000004) [the end of the course. Like many other GCP](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=157.082375) [courses here on Pluralsight, we will base](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=160.8018571428572) [all of our demos around scenarios, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=163.33800000000002) [are set at our hypothetical ecommerce](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=166.26114285714286) [retailer, SpikeySales.com. Our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=170.4995)[hypothetical online retailer is so named](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=173.453) [because it specializes in flash sales of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=176.199) [hot and trending products. This makes it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=179.3348) [an excellent poster child for use of cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=182.42049999999998) [computing because the level of incoming](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=185.29050000000004) [user traffic varies widely. The number of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=187.9818) [incoming user requests is very high during](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=191.66742857142856) [their sales, and it's very low at many](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=194.068875) [other times. This makes an elastic](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=197.34599999999998) [cloud-based solution a natural fit for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=200.02466666666663) [SpikeySales. SpikeySales has committed to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=203.40499999999997" \t "psplayer)[using the Google Cloud Platform because of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=205.67866666666663) [Google's emphasis on serverless](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=208.85999999999999) [technologies, such as BigQuery, Google App](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=211.40824999999998) [Engine, and so on. But in the context of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=214.3637777777778) [this course, Cloud Spanner has an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=217.62328571428566) [important role to play. As SpikeySales](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=219.79999999999998) [goes global, they now have a requirement](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=222.36449999999996) [for transactional consistency at scale. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=225.80675) [the early days of SpikeySales, most of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=228.45414285714287) [their users were concentrated in a few](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=230.9685) [geographies close to the company's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=233.79942857142854) [origins. But now the company has gone](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=236.36766666666665) [global. They have users from around the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=238.80271428571433) [world hitting their website and performing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=240.79028571428572)[transactions. It's become difficult for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=244.42033333333336) [SpikeySales to continue relying on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=246.38933333333335" \t "psplayer) [regional RDBMS technologies like Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=248.5546) [SQL, and therefore Cloud Spanner is the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=251.22175000000004) [solution that they are looking to. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=254.39428571428573) [the perspective which we will be adopting throughout the demos in this course.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=1&mode=live&start=257.18375000000003)

[Introducing Cloud Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live)

[In this video, we will introduce Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=0.724) [Spanner and understand precisely the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=2.617) [differentiating factors between Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=5.528) [Spanner and other RDBMS technologies.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=7.721) [Google Cloud Spanner is a global,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=11.253) [horizontally scaling, strongly consistent](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=13.454) [relational database service built on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=16.489) [proprietary technology. This can be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=19.174) [thought of as a definition for Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=22.077999999999996) [Spanner. There's a lot going on here.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=23.730249999999998) [Virtually every part of this definition](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=25.818) [can do with some explanation. So let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=28.248857142857137) [parse this definition. The first and most](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=31.558400000000002) [important bit, well, Spanner is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=34.57333333333334) [relational database service. This makes it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=37.43428571428573) [one of two managed relational database](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=40.29987500000001) [services available on the Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=42.76566666666667) [Platform. The other, of course, is Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=44.81766666666667) [SQL. Every major cloud provider has](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=47.758142857142865) [competing offerings. The equivalents on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=50.986666666666665) [AWS and Microsoft Azure are RDS, or the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=54.06728571428572) [relational database service on AWS and SQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=58.34366666666666) [database on Azure. But Spanner is very](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=62.345249999999986) [different from all of these other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=65.48600000000002) [technologies in some important ways. The](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=67.80014285714286) [most important of these is probably](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=70.453)[horizontal scaling. This is Spanner's key](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=72.343) [attraction. Virtually all other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=75.75271428571425) [traditional RDBMS services offer vertical](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=77.97940000000001) [scaling. We'll have more to see on the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=80.72525)[difference between these two models. But](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=82.86274999999999) [in a nutshell, horizontal scaling involves](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=84.89750000000001) [adding more nodes to a cluster. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=87.60319999999999) [the preferred modern way of adding](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=91.24000000000004) [capacity. As a result of this, Spanner can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=94.62479999999998) [support datasets of virtually any size.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=97.26675) [Cloud SQL has an upper storage limit of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=100.772) [around 10TB. That's the current limit for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=103.75) [second generation instances, and it's only](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=106.419) [500GB for first generation instances. So](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=108.707) [clearly Cloud Spanner can support vastly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=112.15814285714286) [more data than Cloud SQL. Another](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=114.751) [important advantage of Cloud Spanner is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=117.1502) [the global nature of Cloud Spanner in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=119.3707142857143) [contrast to Cloud SQL, which is regional.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=122.17311111111111) [So Spanner is the only globally](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=125.439) [distributed RDBMS offering on the GCP.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=127.93328571428572) [Cloud Spanner also offers very strong](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=131.127)[consistency guarantees. It is able to do](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=133.791) [so despite being globally replicated. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=137.60300000000007) [is a pretty hard technology challenge to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=139.83142857142857) [solve. It's not easy for a service to both](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=142.09799999999998) [offer strong consistency guarantees and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=145.2646) [global replication and horizontal scaling.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=148.5455) [This is why Spanner is considered cutting-](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=151.858) [edge technology, and this technology is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=154.016) [Google-proprietary. Cloud SQL supports](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=156.784) [Postgres and MySQL, both of which are open](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=160.36) [source database technologies. Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=163.206) [Spanner is proprietary. As with most other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=166.49775) [proprietary technologies, this can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=170.03640000000001) [sometimes be a cause for concern.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=171.5541428571429) [Migration parts can be a little confusing,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=173.8375714285714) [vendor lock-in is a risk, and these are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=176.77414285714283) [important factors to keep in mind while](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=180.06637499999997) [considering Cloud Spanner as a potential](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=181.99571428571429) [candidate for your RDBMS needs. The Google](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=184.49883333333332) [Cloud Platform is justly renowned for its](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=188.86766666666668) [vast array of big data and ML](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=191.54166666666663) [technologies, so let's take a moment to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=194.654) [see where Spanner fits in. Cloud SQL,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=196.8676666666667) [which we've already mentioned, is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=199.3675714285714) [regional RDBMS with limited scaling, up to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=202.16657142857142) [only 10TB. BigQuery, which is maybe the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=205.4402) [most popular GCP technology, is a data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=208.2302857142857) [warehousing solution. At heart, it's meant](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=211.79771428571425) [for OLAP and not for OLTP use cases.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=214.0164444444445) [BigTable is a powerful NoSQL technology,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=217.43614285714284" \t "psplayer) [which shares some similarities with HBase.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=221.15340000000003) [BigTable is a perfect fit when you need](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=224.884" \t "psplayer) [fast reads and writes. BigTable works best](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=227.046) [when data has a natural sort order.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=230.60287500000004) [Datastore, in contrast, is a NoSQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=233.38580000000002" \t "psplayer) [document database, which can be thought of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=236.18000000000004) [as similar to MongoDB or even Redis in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=238.86975) [non-GCP world. All of these technologies](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=243.37800000000004) [are for structure data. Cloud Storage](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=246.5915) [buckets, on the other hand, can be thought](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=248.86785714285713) [of as blob storage. They work best with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=251.14599999999996) [unstructured data, documents, emails,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=253.8353333333333) [music files, video files, images, and so](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=256.041) [on. This is a fairly confusing alphabet](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=260.3151666666665) [soup of technologies, so let's try and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=262.9959999999999) [organize it. GCP storage options can be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=266.5232857142857) [divided into those, which work with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=269.4272857142858)[unstructured data and those meant for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=271.6663333333334) [structured data. Choices for working with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=274.38833333333326) [unstructured data include Cloud Storage](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=276.7056666666666) [Buckets, which are elastic and offer](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=278.98449999999997) [infinite scaling, and persistent disks,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=281.4418333333333) [which are meant for use from within](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=284.229) [compute engine instances and are based on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=286.47600000000017) [pay what you allocate rather than pay what](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=288.84675000000016) [you use. The structured data technologies](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=292.053) [can be split in many ways. Let's divide](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=294.2806666666668) [them up by the method of access. There are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=296.66225000000014) [those, which are accessed using a SQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=299.83750000000003) [interface, and then there are the NoSQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=301.6704444444444) [technologies. If SQL is what you're](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=305.14555555555535) [looking for, then you have a choice of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=307.264142857143) [OLTP, that is transaction processing, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=310.013857142857) [OLAP, that is analytical processing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=312.2648333333334) [technologies. Cloud SQL and Cloud Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=315.36580000000004) [are the OLTP technologies, and BigQuery is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=317.457875) [the ubiquitous OLAP SQL-based technology](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=320.53220000000005) [on the GCP. And finally, within the NoSQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=324.03014285714295)[technologies, at one end we have BigTable,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=328.72100000000006) [which is a columnar HBase style technology](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=331.27400000000006) [and Datastore, which is meant for document](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=334.30039999999997) [databases. Let's focus our attention on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=338.513142857143) [the OLTP offerings and spend a moment](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=340.94271428571415) [clearly understanding the differences](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=343.4711666666667) [between Cloud SQL and Cloud Spanner. Now](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=344.9341999999999) [both Cloud SQL and Cloud Spanner are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=348.61275) [relational technologies. That means that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=350.949) [they both offer ACID support. In this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=353.92675) [context, Cloud Spanner has some levels of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=356.1472857142857) [ACID++ support. We'll have more to say on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=358.78749999999997) [this in a moment. Cloud SQL is regional.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=361.4061999999999) [Cloud Spanner instances could be regional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=364.471) [or global. Cloud SQL supports vertical](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=366.582) [scaling, which means that as your dataset](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=370.09) [grows, you've got to make your Cloud SQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=372.26)[instance more powerful. You add more](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=374.663) [memory and more disk. Cloud Spanner, on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=377.90271428571424) [the other hand, scales horizontally. So as](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=380.3665) [your data needs grow, you add nodes to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=383.15677777777773) [your Cloud Spanner instance. Cloud SQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=386.2818) [works best for relatively small datasets](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=389.0721428571428) [of less than 10TB, and it also supports](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=391.35312500000003) [only lower IO operations per second. Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=394.6361428571429) [Spanner, on the other hand, because of its](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=398.4771666666667) [horizontal scaling can be scaled up to any](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=400.6834285714285) [size and any level of IOPS. Cloud Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=403.8708000000001) [can support any data size and any level of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=407.231) [user traffic, of course provided you have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=410.31019999999995) [the budget to pay for it. Cloud SQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=412.2005000000001)[supports MySQL and Postgres, both of which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=415.3754999999999) [are open source database technologies.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=418.29100000000005) [Cloud Spanner is distinctly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=420.912) [Google-proprietary. And finally, Cloud SQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=423.6695999999999) [is relatively cheap. Cloud Spanner is relatively expensive.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=2&mode=live&start=426.36128571428577)

[Transactional and Analytical Processing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live)

[As a cloud architect, you will be called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=0.816) [upon to make choices between Cloud Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=3.6365) [and BigQuery. so let's also understand](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=6.0936) [when we would choose each of these](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=8.331142857142858) [formidable technologies. At heart, Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=11.368666666666668) [Spanner is an OLTP, or online transaction](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=13.633571428571429) [processing system, and BigQuery is an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=16.8094)[OLAP, or online analytical processing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=19.302999999999994) [system. So in a nutshell, use BigQuery for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=21.907000000000004) [OLAP, and use Cloud Spanner for OLTP.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=25.34157142857143) [Well, the next obvious question is, how](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=28.433714285714288) [does one clearly distinguish between these](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=31.6) [two types of use cases? This is not always](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=33.98225000000001) [a simple question to answer, so let's take](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=36.96500000000001) [a moment to understand the differences](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=39.01371428571427) [between transactional and analytical](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=41.19225) [processing. Let's view this question from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=44.401250000000005) [the perspective of two employees at](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=46.76883333333333) [SpikeySales. John works in order](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=49.966333333333324" \t "psplayer) [management support, and he is responsible](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=52.24600000000001) [for tracking and delivering orders and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=54.22300000000001) [ensuring their timely execution. Anna, on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=56.824857142857134) [the other hand, is in the business](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=59.67777777777778) [intelligence team. She is a revenue](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=61.469) [analyst and closely monitors the state of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=63.458) [the business. The one number which she](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=66.785) [tracks every day is year-on-year revenue](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=69.321) [growth. Let's consider their typical use](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=72.99214285714288) [cases. John, who is in order management](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=76.15400000000002) [support, will often have to deal with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=78.40657142857147) [delivery issues. Maybe 20 deliveries were](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=81.58974999999998) [scheduled for Kent, Washington. They were](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=83.99333333333331) [delayed because the courier company](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=86.41459999999998) [fulfilling the order had a computer](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=88.29466666666664) [outage. John will have to act. He will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=91.4772) [have to intervene and assign that order to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=94.33399999999999) [a different company. This requires John to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=96.89540000000001) [be paying attention to individual](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=99.94128571428574) [transactions. He has to be aware of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=102.01766666666667) [fate of individual orders. Let's take](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=104.03922222222222) [another use case. Maybe three customers](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=106.38385714285714) [would like to ship orders to a different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=108.64414285714285) [address. Address change requests are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=111.97419999999998) [common enough. John has a procedure for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=114.09333333333332) [handling them. He needs to update the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=116.73014285714284) [addresses on those shipments and reroute](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=118.76425000000002) [them. Once again, this requires John to be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=121.35324999999999) [aware of the characteristics of an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=124.25662499999996) [individual transaction. Let's contrast](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=127.30499999999998) [this now with some of Anna's typical use](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=128.94075) [cases. Very often, her manager requests](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=131.6508) [updates on revenues for the previous month](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=134.80599999999998) [or the previous quarter. Or maybe the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=137.94050000000004) [board or the CEO have concerns around last](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=140.70466666666667)[month's revenue. Anna will then pull up](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=144.409) [data for a long period of time. She will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=147.174) [track long-term revenue performance. She](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=149.953) [will perhaps compare last month to the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=152.051) [corresponding month in previous years.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=154.494) [Anna is not focused on individual](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=157.834) [transactions, rather she needs to have a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=160.079) [bird's eye view of long-term trends.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=162.731) [Hopefully, these examples have helped to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=166.097) [drive home the difference between](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=167.834) [transactional processing and analytical](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=169.61)[processing. Let's make sure we clearly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=172.96280000000002) [understand those differences.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=176.240375) [Transactional processing is all about](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=177.704) [ensuring the correctness of individual](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=179.692)[entries. Analytical processing is all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=182.62950000000004) [about analyzing large batches of data. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=184.78340000000006) [classic transaction processing, access to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=189.90175) [recent data, perhaps from the last few](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=191.957) [hours or the last few days, is most](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=194.16750000000002) [important. Analytical processing often](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=197.07833333333332) [requires access to relatively old data,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=199.25840000000002) [going back months or even years.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=201.77571428571434) [Transaction processing applications update](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=205.22) [data frequently, so there are a lot of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=207.725) [writes and a lot of updates. Analytical](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=209.885" \t "psplayer) [processing centers around one of writes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=213.06783333333334) [followed by long-running reads. Class](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=217.0604) [transaction processing requires fast](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=220.8064) [real-time access. Analytical processing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=222.696) [relies on more long- running jobs. OLTP](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=225.10166666666666) [applications closely enforce schemas, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=229.817) [that's why they usually accept data from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=232.65900000000002) [only controlled single data sources. OLAP](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=235.36833333333337) [applications, on the other hand, are often](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=238.74033333333335) [data warehousing based. They have data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=240.92479999999998) [coming in from many different sources.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=242.90257142857146) [That data then needs to be aggregated. Now](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=244.37371428571427) [I would like to emphasize quite strongly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=247.85257142857142) [here that these differences apply to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=250.014) [classic definitions of transaction and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=252.54199999999997) [analytical processing. So this list of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=254.582) [differences is only partially applicable](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=257.6958571428571) [to Spanner and BigQuery. Spanner goes far](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=259.6566666666667) [behind traditional relational database](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=263.3159999999999) [technologies, and BigQuery goes far beyond](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=265.9146666666667) [traditional data warehousing technologies.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=268.8073333333333) [In fact, these two technologies even share](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=271.475) [some important differences. For one, both](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=273.368) [of them have a SQL-based access metaphor.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=276.66987500000005) [This is an important point in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=279.2266666666667)[organizations because of how ubiquitous](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=281.2016666666667) [SQL has become. Both of them scale to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=283.18874999999997) [petabytes. Neither of them really has an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=287.14066666666673) [upper limit on how much data they can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=289.0759999999999) [support. Both of them offer horizontal](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=292.15000000000015) [scaling with replication, and this is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=294.42842857142864) [because Cloud Spanner is pretty different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=296.6650000000001) [from other RDBMS technologies. But that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=298.86433333333343) [gets us to maybe the most important](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=301.2482857142857) [difference, BigQuery supports eventual](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=304.10639999999995) [consistency; Cloud Spanner supports strong](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=306.63174999999995) [consistency. This means that BigQuery is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=309.78939999999994) [not quite ACID-compliant. Cloud Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=312.7438749999999) [does offer strong ACID support. BigQuery](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=315.37328571428577) [is serverless. It requires no](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=319.016) [administration. In fact, you cannot even](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=321.89525000000003) [define indices in BigQuery. Cloud Spanner,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=324.2281111111111) [on the other hand, requires cluster](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=326.077)[creation and a fair amount of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=327.79471428571424) [administration. BigQuery intentionally](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=330.704) [abstracts the user from schema design, so](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=332.66740000000004) [there are no indices to be created, no](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=335.72400000000005) [provisioning to be factored in. Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=338.25171428571434) [Spanner, on the other hand, does place](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=340.1198571428572) [quite a great responsibility on the user.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=342.53599999999994) [It's important to have smart choices](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=345.857) [around primary and secondary keys. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=347.9955714285715) [can really impact the performance of your Cloud Spanner installation.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=3&mode=live&start=350.8045714285714)

[Horizontal Scaling and Strong Consistency](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live)

[In this video, we'll talk a little bit](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=1.234) [about the unique selling proposition of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=2.718) [Cloud Spanner. We will see how Spanner is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=5.114) [virtually the only horizontally scaled](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=7.785) [database to offer strong consistency](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=10.288) [guarantees. The terms horizontal scaling](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=13.657999999999998) [and strong consistency will appear time](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=15.946666666666665) [and time again while we're discussing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=18.448285714285714) [Cloud Spanner. So I would like to make](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=20.8578) [sure that we completely understand exactly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=22.613000000000003) [what these terms mean and what they do not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=24.4382)[mean. Let's start with two types of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=27.518375000000013) [scaling. In vertical scaling, as the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=29.9345) [dataset grows in size, we'll respond by](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=32.73085714285714) [making our server more powerful. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=35.40525)[horizontal scaling, as our data processing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=38.008799999999994) [needs grow, we just add more servers. It's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=40.70266666666666) [important to know that those servers are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=44.31442857142857) [all going to run on generic hardware. No](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=46.612375) [one of those servers individually is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=49.59871428571429) [particularly powerful or differentiated.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=52.003) [Vertical scaling is implemented using](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=55.883) [monolithic architectures. Horizontal](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=58.182) [scaling is implemented using distributed](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=60.1908) [architectures. This monolithic](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=63.15950000000001) [architecture in vertically scaled](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=65.35499999999999) [applications eliminates the need for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=67.51085714285713) [orchestration. Horizontally scaled](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=70.32514285714284) [architectures require those generic pieces](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=71.98249999999999) [of hardware, those generic servers, to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=74.43240000000002) [remain in sync with each other, and that's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=76.78228571428569) [why they do require orchestration. The](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=79.372625) [data stored in horizontally scaled](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=82.94433333333333) [application is too large to fit entirely](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=84.616)[on any one server. So that gives rise to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=87.41775) [the need to pack up the data, to shard the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=90.36822222222226) [data, and store it in a distributed](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=92.987) [manner. So horizontally scaled](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=96.24637500000001)[applications virtually always shard data.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=98.17750000000001) [Vertically scaled applications will not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=101.329) [shard data. Vertically scaled applications](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=103.545) [have a single server, and so there is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=106.787) [obviously no need for replication. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=108.854) [horizontally scaled applications, because](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=111.55575) [of the large number of servers and also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=113.133) [because of the inherent unreliability of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=115.76533333333333) [any individual node in the instance,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=118.3187142857143) [replication of data is extremely](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=120.819) [important. Replication also involves a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=123.78816666666668) [replication delay. This is avoided by](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=126.79666666666668) [vertically scaled applications. They have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=129.6062857142857) [no replication delay because they have no](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=131.31228571428574) [replication. Horizontally scaled](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=133.7396666666667) [applications will always have to incur the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=135.352) [hit of a replication delay. The need to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=137.655375) [replicate data and keep those different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=141.01583333333338) [replicas in sync also makes consistency](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=143.04142857142855)[hard. Vertically scaled applications do](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=146.47119999999995) [not use replication, and so it's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=149.00133333333338) [relatively easy to ensure consistency.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=151.18385714285716) [There is one master copy, and that's all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=152.94166666666666)[that there is to it. Horizontally scaled](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=155.80433333333332) [applications, which have different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=159.14433333333332) [replicas have to work hard to ensure](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=161.03557142857144) [consistency. As a result, vertically](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=164.05649999999997)[scaled applications usually offer strong](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=166.12966666666662) [consistency guarantees. Horizontally](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=168.71119999999996) [scaled applications usually offer weak](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=170.4985) [eventual consistency. The C in ACID stands](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=173.595) [for consistency, and so it should come as](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=176.80071428571432) [no surprise that vertically scaled apps](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=178.88366666666667) [offer better and stronger ACID support.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=180.83149999999998) [This is why they are usually used in OLTP,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=184.19) [while horizontal applications are usually](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=187.491) [used in OLAP. Now once again, I would like](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=189.871) [to emphasize that Cloud Spanner is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=192.518) [different. Even though it's horizontally](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=194.78171428571423) [scaled, it suffers from virtually none of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=196.59339999999997) [these drawbacks, which we have just](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=198.80685714285715) [mentioned. Let's double-click on two](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=201.35933333333335) [important terms here, strong consistency](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=203.30066666666664) [and eventual consistency. In the case of a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=206.20899999999997) [strongly consistent system, an update](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=209.7395714285714)[request comes in, the data on that system](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=211.8845) [is updated, and then the request returns.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=215.75342857142851) [So there's no possibility that any client](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=219.077) [ever reads a stale copy of the data. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=221.761) [contrast, in a system with eventual](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=226.04399999999998) [consistency, an update request comes in,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=227.676) [the master gets updated, but other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=230.778) [replicas might not, and then the request](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=233.3777142857143) [returns. Now, at this point, there are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=236.72271428571426) [other replicas which need to be updated.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=239.20342857142865) [Because of this period or this lag during](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=242.659) [which there are replicas which still have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=245.074) [the old data, there is always the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=247.168) [possibility that a read operation on that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=249.277) [replica might end up fetching stale data.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=251.674)[So in a system which offers strong](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=254.896) [consistency, there is no possibility of a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=257.009) [read fetching stale data. With eventual](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=259.295) [consistency, this possibility does exist.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=262.55366666666663) [Now, of course, there are no free lunches,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=265.723) [so strong consistency brings down system](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=267.702) [performance. Write latency depends on the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=270.5871428571428) [replication latency. Eventually consistent](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=273.8937142857143) [systems tend to be a lot faster because](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=275.6477142857143) [the write latency there is independent of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=278.2235714285714) [the replication latency. And now we are in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=281.38849999999996) [a position to understand the USP, or the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=284.39744444444455) [unique selling proposition of Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=286.7832857142858) [Spanner. Currently, Cloud Spanner is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=289.3765) [virtually the only horizontally scaling](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=291.8564999999999) [RDBMS to offer strong consistency. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=294.03214285714284) [a pretty big deal. This is only made](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=297.7873333333333) [possible because of the concept of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=300.74925) [TrueTime. Cloud Spanner works on the basis](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=303.24674999999996" \t "psplayer) [of a highly available distributed clock](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=305.5095) [called TrueTime, which is available to all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=308.09860000000003) [applications on the GCP. And using](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=310.728) [TrueTime as its secret source, Spanner is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=314.093" \t "psplayer) [able to offer something even stronger than](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=316.93) [strong consistency. It's able to offer](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=320.0645) [something called external consistency,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=322.73799999999994) [which means that the system behaves as if](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=324.024) [all transactions were executed](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=326.97400000000005) [sequentially on one server and executed in order of TrueTime.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=4&mode=live&start=328.83883333333335)

[Instances and Nodes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live)

[Cloud Spanner is a fairly involved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=1.239) [technology, and that's why we have a fair](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=3.325) [amount of theory and conceptual ground to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=5.624) [cover before we can get to the demos. So](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=7.9) [let's keep going with some of that. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=11.069125) [clearly understand what an instance of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=13.3325) [Cloud Spanner is and what it contains. For](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=16.033125) [a vertically scaled technology, like](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=20.1502) [Google Cloud SQL, there is really no](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=22.27725) [difference between an instance and a node](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=24.421) [or a server. However, in the case of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=26.806) [horizontally scaled technologies, an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=28.854) [instance is not a node. In fact, an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=31.220333333333336) [instance can consist of many different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=33.81949999999999) [nodes. So a Cloud Spanner instance can be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=35.782666666666664) [part of as a server. An instance has two](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=39.420750000000005) [important properties, the instance](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=43.07733333333333) [configuration and the number of nodes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=44.60066666666666) [within in. The instance configuration](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=46.836999999999996) [itself might be either regional or](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=48.82600000000001) [multi-region. This configuration governs](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=52.34025000000001) [the location of the nodes. The number of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=54.36099999999999) [the nodes depends on the dataset size. The](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=57.24625000000001) [rule of thumb enforced by Cloud Spanner is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=60.05600000000001) [just about 2TB of data per node.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=63.316749999999985) [Technically, the storage unit used here is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=66.24380000000001) [tebibyte, but tebibyte and terabyte are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=68.91857142857143" \t "psplayer) [just about equivalent. In production](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=71.62137500000003) [systems, it's recommended that you have at](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=73.80933333333333) [least three nodes in your instance, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=75.6194285714286) [there's no reason why your instance cannot](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=78.369) [scale up to even dozens of nodes if you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=80.71822222222222) [have the budget to support it and if your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=83.3618888888889)[use case calls for it. In contrast to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=85.82666666666667) [this, by the way, the largest possible](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=88.18785714285714) [Cloud SQL dataset is around 10TB. That](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=90.52928571428569) [would correspond to a five-node instance](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=93.76342857142856) [on Cloud Spanner. Not particularly large.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=96.61919999999999) [Let's understand the instance](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=100.728) [configuration in a little more detail.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=102.49920000000002) [This is immutable. So after you create](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=104.465) [your instance, you cannot change your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=106.753) [instance from a regional to a multi-region](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=108.985) [or vice versa. Regional instances will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=111.846) [have all of their data residing in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=115.072) [same region. Three read-write replicas](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=118.08640000000003) [will be created, and these will be in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=120.30499999999999) [different zones. In contrast, a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=123.76928571428572) [multi-region instance will distribute data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=125.85500000000002) [across different regions for higher](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=128.1902) [availability and global access. A complex](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=131.086) [replication scheme exists for both types](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=134.7123333333333) [of instances, and we will discuss Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=137.23614285714282) [replication in more detail. Coming now to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=139.85866666666666) [consistency guarantees, we have already](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=143.74260000000004) [discussed how external consistency is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=145.95649999999998) [supported by Cloud Spanner even in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=148.11200000000002) [multi-regional configurations. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=151.4985) [made possible through the use of TrueTime](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=153.69099999999997) [technology, which is a highly available](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=155.96166666666667) [distributed clock. We discussed this in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=158.99866666666665) [passing already. TrueTime makes external](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=162.0553333333333) [consistency possible even with a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=165.07424999999998) [multi-regional configuration, which means](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=167.261) [that we could have an instance spread](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=168.74849999999998) [across different global regions and still](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=171.48633333333333) [treat that instance that just one machine](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=173.73966666666672) [or one server. Remember that Spanner is an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=176.76425) [OLTP technology, so transactions submitted](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=180.4083333333333) [to Spanner are guaranteed to be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=182.74260000000004) [serializable. The order of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=185.77216666666664) [transactions within the database is the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=187.3651428571428) [same as that which is seen by the users.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=189.07) [This is a formidable technical](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=192.21914285714286) [achievement. When might you go with a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=195.09550000000002) [multi-region configuration? Well, one](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=197.271) [determining factor might be the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=200.096) [availability that you want. Regional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=201.821) [configurations have an availability of 4](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=204.50125) [nines. Multi-regional configurations have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=207.86725) [higher availability because they will not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=210.1815) [go down even if any one individual region](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=212.80928571428572) [is taken down. Now, of course, the penalty](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=216.37566666666666) [for this higher availability is a write](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=218.97975) [latency. Regional configurations have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=222.00539999999995) [lower write latency. Multi-region](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=224.24400000000003)[configurations will have lower read](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=226.4484) [latencies. So again, if your application](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=229.298) [is global, if you have users all around](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=232.36925) [the world who need to read your data, a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=234.8063333333333) [multi-region configuration probably makes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=238.16719999999998) [more sense. Another important decision](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=240.5175) [variable here is cost. Regional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=243.06285714285715) [configurations are less expensive. We will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=245.3932) [discuss Cloud Spanner pricing in more](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=248.34885714285716) [detail. Instance configuration was the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=250.51866666666666) [first important property of an instance.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=253.082) [The second was the node count. Recall that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=255.082) [each node provides up to 2TiB of data. But](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=258.264) [it's important to remember that nodes do](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=261.8777142857143) [not only provide storage; they also fill](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=264.71999999999997) [requests. So when you add more nodes, not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=267.8202500000001) [only are you getting more storage; you are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=269.95111111111106) [also reducing latency in your instance.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=272.0357142857142) [This is an important point. Nodes are not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=275.337) [pure storage. They are combination of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=278.17060000000004) [storage and compute. In production](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=280.9315714285713) [instances, it's recommended that you have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=283.357) [a minimum of three nodes. Remember that it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=285.32024999999993) [is always possible to add nodes after](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=288.4682857142857) [creation. This needs to be done manually](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=291.8103333333333) [so there is no autoscaling for nodes in a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=293.73800000000006) [Cloud Spanner instance. But this is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=297.3253333333335) [something that you can do manually](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=299.4295) [yourself. It's also possible to set up](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=300.9678333333334)[Stackdriver monitoring alerts for Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=303.87700000000007) [Spanner instances. One more important](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=306.3856666666667) [point to keep in mind, nodes are not the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=308.99637499999994) [same as replicas. We are about to discuss](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=311.73142857142864) [replication in Cloud Spanner, but for now](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=314.1138571428573) [just know that adding nodes is going to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=316.343625) [make each replica more powerful. Remember](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=319.08112500000004)[nodes are not just storage. They are both](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=321.58462499999996) [compute and storage. So when you add](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=325.0229999999999) [nodes, each replica, in effect, is getting](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=327.30342857142847) [additional CPU and memory, and this is why](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=329.8039999999999) [as you add nodes, the latency of your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=332.48577777777786) [instance goes down, and the performance goes up.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=5&mode=live&start=335.17885714285717)

[Schema and Data Model](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live)

[We've been going on and on about how Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=1.215) [Spanner differs from traditional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=3.193) [relational databases. These differences](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=5.642333333333332) [also extend to the schema and the data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=7.577000000000001) [model. So let's spend some time](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=10.100499999999998) [understanding Spanner's schema and data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=11.916) [model and, in particular, how interleaved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=14.5596) [tables and parent-child relationships](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=16.9844) [operate. Let's start with the traditional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=19.295) [RDBMS layout. Data is arranged in tables,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=22.46942857142857) [also called relations. These tables have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=25.362375000000007)[rows and columns. The columns are called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=27.749000000000002) [the schema. Here, for instance, we have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=30.34166666666666) [two relations, a customer table and an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=32.56214285714285) [order table. Every customer is uniquely](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=35.1567142857143) [identified by a customer ID. Every order](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=37.404142857142865) [is uniquely identified by an order ID. The](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=40.30466666666666) [customer ID is also included in the orders](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=43.921499999999995)[table, and this is what makes it possible](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=47.135000000000005) [for us to join these two tables. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=49.380375) [also called a foreign key constraint.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=52.597249999999995) [Let's now quickly understand how Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=54.785) [would go about storing the same data.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=57.029) [Relational tables are still maintained,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=59.463) [and primary keys still identify rules](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=61.764) [uniquely. So this bit is the same. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=64.8) [does not change in Spanner versus](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=67.14257142857143) [traditional RDBMSs. But where things get](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=68.952) [different in Spanner is in the concept of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=72.127) [splits. Spanner has the idea of a split,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=75.64077777777781) [which is a set of rows from different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=78.2255) [tables, which can be moved around](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=81.2991666666667) [independently. The crucial bit here is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=84.05416666666666) [that disk split involves data from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=86.08712500000001) [different tables, and a split can move](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=88.7656) [around independently of all other splits.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=91.84900000000003) [Splits can be thought of as the individual](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=94.336) [units of replication in Cloud Spanner.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=96.703) [Each split needs to be clearly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=99.518) [identifiable in some way. And effectively,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=101.87514285714283) [requests from users are going to be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=104.407) [directed to the correct split based on a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=106.056) [primary key. And in this way, we can see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=108.598) [that data from different tables from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=111.443) [different relations is going to be grouped](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=113.522) [together or interleaved to form a split.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=116.305) [This means that careful choice of primary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=119.933) [keys is extremely important in Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=122.256)[Spanner. In this regard, Cloud Spanner is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=125.23971428571426) [somewhat similar to BigTable or HBase. If](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=127.66128571428573) [you are not careful in your key design,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=130.93666666666667) [your instance will suffer from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=133.238) [hotspotting. We need to be careful and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=135.76716666666664" \t "psplayer) [design our keys so that requests will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=137.6796666666667) [evenly get distributed across different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=139.5563333333333) [nodes. Splits are implemented using](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=141.95049999999998) [parent-child table relationships. Given](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=144.71460000000002) [different tables which have customer data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=147.654) [and order data, Spanner will require us to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=149.81142857142856)[specify a parent-child table relationship.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=153.55228571428572) [And unlike traditional databases, these](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=156.193) [relationships can be mastered to several](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=158.52366666666666) [levels. Here we need to define orders as a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=160.79171428571428) [child table and customers as the parent](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=164.04425) [table. Once we do that, the orders table](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=167.06799999999998) [is going to be split based on the customer](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=170.1703333333333) [ID, that's the foreign key, which, of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=172.59999999999997) [course, is the primary key of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=174.70477777777776) [customers table. And what's more, Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=176.384) [will actually physically interleave the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=179.0352)[rows from the child table with rows from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=181.76575) [the parent table. And in this way,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=184.36249999999998) [parent-child splits will be created and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=187.01314285714287) [stored together. This relationship between](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=189.7722) [the semantics between the meaning of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=192.2922) [data in our tables and the physical](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=194.42462500000002) [storage is extremely important. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=197.26600000000002) [key to the high performance that Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=200.14725) [gives us. If we zoom in on the data within](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=202.89222222222222) [any one split, we can see that any row](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=205.85844444444444) [from the parent table can be referenced](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=209.05800000000002) [with the primary key. Any row from the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=211.5168) [child table can be referenced using the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=214.31950000000006) [primary key of the parent table, which is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=216.68171428571426) [Customer ID, along with the primary key of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=219.74799999999996) [the child table, which is the Order ID.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=222.07799999999995) [And from this, we can see an important](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=225.128) [property of keys in Spanner. The primary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=227.085) [key of the parent table needs to be a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=231.23350000000002) [prefix of the primary key of the child](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=233.848) [table. If you're familiar with either](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=236.19433333333333) [HBase or BigTable, this idea should again](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=238.58328571428572" \t "psplayer) [strike you as familiar. There are many](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=241.9436) [structural and conceptual similarities](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=244.6465) [between Cloud Spanner and BigTable. So](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=246.33016666666668) [again, in Spanner interleaved parent-child](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=249.81300000000002) [tables are stored together. The semantics](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=252.37400000000002) [of the data and the physical layout are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=255.30749999999998) [linked to each other. This gives us a fast](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=257.5) [retrieval for data that is commonly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=260.312125) [accessed together. Now at this point, you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=262.80160000000006) [might be thinking that foreign key](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=265.0522499999999) [relationships and parent- child](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=266.864) [relationships are hardly unique to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=268.47485714285716) [Spanner. These are an old and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=270.90914285714297) [well-established feature of relational](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=272.87683333333325) [databases. And you're right. But the point](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=274.80800000000005) [is that Spanner takes this whole concept](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=277.0967499999999) [one level further. For instance, one can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=280.09737500000006) [define interleaved tables up to seven](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=282.9036666666666) [levels deep. And in this way, Spanner will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=285.4329999999999) [actually identify hotspots and split based](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=288.0270000000001) [on the key of the parent table. It will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=290.372857142857) [also automatically create splits and go](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=294.1546666666667) [ahead and move data around to balance](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=296.7525) [load. Splits are also the atomic unit of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=299.40257142857143) [replication, which means that a split is replicated independent of any other split.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=6&mode=live&start=302.5511428571429)

[Replication](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live)

[We just mentioned that splits are the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=0.985) [atomic unit of replication. Let's now turn](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=3.114) [our attention to how replication in Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=5.728714285714286) [Spanner works. It turns out that Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=8.3658) [Spanner is built on top of a proprietary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=10.855888888888884) [replicated filesystem, Colossus, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=13.98766666666667) [Spanner writes database mutations to file.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=16.2824) [The filesystem then takes care of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=19.537499999999998) [replication, as well as the recovery. But](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=22.036500000000004) [that's not all. Spanner further adds](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=24.740500000000004) [another level of replication. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=27.780857142857148) [based on the logical grouping of similar](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=30.417749999999998) [data into splits. So each split is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=32.75475) [individually replicated by Spanner. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=36.1915) [is not something that is down at the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=38.284444444444446) [Colossus that is at the filesystem level.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=40.152) [Split-level replication happens within](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=42.631) [Spanner. Splits are only an implementation](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=45.649400000000014) [detail, but they are an important one](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=48.45566666666667)[because they actually govern on the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=50.175499999999985) [performance of our instance. It's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=52.3165) [important for splits to correctly reflect](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=54.423500000000004) [logical groupings because that is how the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=56.858666666666664) [data is going to be split. How can Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=59.46975) [Spanner infer the semantics of the meaning](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=62.11242857142857) [of our data? The answer is via](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=64.4695) [parent-child relationships, which we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=66.833) [enter. This is information or metadata](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=69.23525) [which we provide Cloud Spanner. These](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=71.882) [parent-child relationships between tables](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=74.86675000000001) [are used to interleave rows from different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=76.91114285714286) [tables and group them together into](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=79.53733333333334) [splits. These interleaved tables form the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=82.16516666666666) [basis for the physical colocation of rows,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=85.22957142857142) [exactly as in BigTable. Users can control](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=87.9254) [splits through their choices of primary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=90.957) [keys and parent-child relationships. Now](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=93.746) [remember that Spanner is a distributed, a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=96.69271428571427) [horizontally scaling system, and that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=99.35325) [means that it's going to have both](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=101.15688888888887) [replication, as well as sharding. And if](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=102.637) [you're going to have different replicas](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=105.84871428571428) [and different shards of the data, we need](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=107.18771428571428) [to have some mechanism to keep those](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=109.90799999999999) [replicas in sync. And this is achieved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=112.449) [using Paxos, which is a standard consensus](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=115.21466666666666) [algorithm. This leads back to our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=118.47750000000002) [discussion of strong consistency. Remember](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=121.20755555555556) [that strong consistency implies that no](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=123.505) [client can ever read stale data. Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=126.61000000000001) [offers strong consistency. In fact, it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=130.14024999999998) [offers an even stronger version of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=132.94975000000002)[consistency called external consistency.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=135.3654) [And this is possible because Paxos](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=138.523) [implements a mechanism for the different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=140.41) [replicas to be updated right away and kept](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=143.356) [in sync with minimal replication delays.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=145.936) [This is why Spanner is able to deliver](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=149.82) [both consistency and performance. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=151.73911111111107) [see how that happens. It turns out that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=154.694) [each split has a designated leader. That](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=157.34150000000002) [leader is responsible for handling all of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=159.83240000000004) [the writes to that split. It's the master](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=162.2868571428572) [in a sense. In addition to the leader,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=164.86333333333334) [there are different replicas of the same](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=167.351) [split. It turns out that there are three](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=170.03375000000003) [different types of replicas. Read-write](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=171.7668)[replicas, each of which can become the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=174.12733333333333) [leader and can also participate in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=177.2125714285714) [leadership election. Then there are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=180.32750000000001) [read-only replicas, which can neither](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=182.45420000000004) [become leaders nor vote. And finally,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=184.6604285714286) [there are witness replicas, which cannot](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=187.25733333333332) [become leaders, but which can participate](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=189.19514285714286) [in the leadership election. It's worth our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=191.4328) [while understanding each of these types of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=194.64428571428573) [replicas in some detail. Read-write](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=196.86271428571425) [replicas will maintain a full copy of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=198.73633333333333) [data of the split. Each read-write replica](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=201.76685714285716) [can serve both reads and writes. It can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=204.39800000000002) [also vote on whether to commit a specific](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=207.80337500000005) [write. This is a Paxos algorithm. The](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=211.25516666666664) [leadership election, which determines what](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=214.89933333333332) [updates filter through to the split. In a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=216.84279999999998) [single region Cloud Spanner instance, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=220.1867142857143) [only type of replica is a read-write](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=222.511) [replica. Let's move on and discuss](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=225.59099999999998) [read-only replicas. These are only used in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=227.9645714285714) [multi-region instances. In order to field](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=231.6572857142857)[read requests and reduce read latency,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=234.15500000000003) [they maintain a full copy of the data of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=236.19025) [the split. They are replicated from the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=239.52640000000002) [read-write replicas, but they can neither](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=242.11499999999995) [vote on commits nor participate in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=244.72142857142856) [elections to become the leader. Read-only](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=247.502) [replicas only serve to reduce the latency](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=250.91066666666666) [on read requests. Now it turns out that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=254.63687500000006) [there are two different types of reads in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=256.92699999999996) [Cloud Spanner, strong reads and stale](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=259.47685714285717) [reads. We'll discuss this in more detail](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=261.93160000000006) [in a bit. But for now, just be aware that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=263.70259999999996) [read-only replicas can solve both types of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=266.72125) [reads. Stale reads can be served by a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=269.946857142857) [read-only replica without checking with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=272.52812500000005) [the leader. On the other hand, strong](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=274.5576666666666) [reads will incur a delay from a roundtrip](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=276.84862499999997) [to the leader. Witness replicas are the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=280.32275000000004) [third type of replicas. These are also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=283.13750000000005) [only used in multi-region instances.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=285.89150000000006) [Unlike the other two types, they do not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=288.409) [maintain a full copy of the data. The](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=290.349)[difference is that they can vote to commit](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=293.66475) [on writes, and they can vote in elections](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=295.80625) [to determine the leader. However, they](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=299.1148) [cannot become leaders themselves. So how](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=302.0296666666667) [many replicas of a given split are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=305.1845) [actually going to exist in an instance? To](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=307.31125) [answer this question, let's go back to the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=309.927375) [two types of instance configurations. In a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=312.05449999999996) [multi-regional instance, there are going](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=315.44350000000003) [to be two read-write regions, one witness](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=317.2721428571428) [region, and additionally, there might be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=320.1435) [some read- only regions for low latency](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=322.2551428571429) [reads. Each read-write region is going to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=326.07366666666667) [have two read-write replicas. Each witness](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=328.58300000000014) [region is going to have one witness](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=331.925) [replica. And in addition, there may be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=333.8844) [some read-only replicas. In regional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=336.95550000000003) [configurations, on the other hand, there](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=338.9316666666667) [will be three read-write replicas](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=340.89200000000005) [distributed across different availability](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=342.92475) [zones. And so, we can finally count the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=345.5447142857143) [number of replicas. There is going to be a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=349.4578) [minimum of five replicas in a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=351.92799999999994) [multi-regional configuration and a minimum](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=354.55000000000007) [of three replicas in a regional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=356.9565) [configuration. This helps explain two](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=360.0285)[facts. It helps explain why both regional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=363.0097999999999) [and multi-regional configurations have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=365.58342857142867) [such strong availability. Regional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=367.38825) [configurations are 4 nines, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=370.54080000000005)[multi-regional configurations are 5 nines.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=373.0756666666667) [And we can also see from this why Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=375.634) [Spanner is so expensive. There is a high](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=377.783) [cost of storage, and there is also a whole](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=381.0381428571428) [bunch of compute going on in the implementation of Paxos.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=7&mode=live&start=383.63233333333335)

[Best Practices](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live)

[In this section, we are going to cover](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=1.31) [some of the best practices associated with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=2.6246666666666676) [using Cloud Spanner. Let's start from the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=4.970428571428571) [basics. A primary key, as usual, uniquely](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=8.430600000000002) [identifies each row in a table. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=11.162571428571429) [addition, a primary key has another role](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=14.879) [to play in Spanner. Rows which share](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=17.098) [common prefixes within their primary keys](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=19.901) [are going to be stored together. So the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=22.607) [primary key also determines the order of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=24.864285714285714) [physical storage. In this respect, Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=27.2885) [is similar to HBase and BigTable. A](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=29.71828571428572) [secondary index is an index on a non-key](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=33.3414) [column. This is going to require](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=36.184600000000025) [additional space because this index is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=38.25357142857143) [going to exist outside of the primary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=40.43614285714285) [storage of the split. In this context,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=43.47200000000001) [Spanner support something known as a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=46.417) [STORING clause. This is an instruction to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=48.453) [Spanner to store an additional copy of a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=51.176) [column effectively indexing that column](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=53.678) [for fast lookup. Choose your primary key](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=55.90716666666666)[carefully in order to avoid hotspots. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=59.06825) [particular, there are some choices of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=62.276714285714284) [primary key which are particularly bad,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=63.991) [monotonically increasing or decreasing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=66.402) [values, auto-increment keys, for instance.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=68.589) [These are a common choice on vertically](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=71.648) [scaling systems. These are a particularly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=73.793) [bad choice for Cloud Spanner. This, of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=77.072) [course, poses some challenges for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=80.35828571428571) [migrating data from traditional RDBMSs](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=81.809) [into Spanner, and so you might want to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=84.37983333333334)[consider various workarounds. You might](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=87.09899999999999) [want to reverse the order of the key](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=89.03) [values. You might want to hash your unique](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=91.497375) [key values so that they are no longer](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=93.874375) [naturally increasing or decreasing. You](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=96.197) [might want to consider using universally](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=98.8805) [unique identifiers, or bit-reversing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=101.35466666666666) [sequential values in order to eliminate](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=104.339) [the monotonic nature of the keys. However,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=107.24575) [none of these is a particularly simple](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=110.56328571428571) [solution. And so it is true that migrating](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=112.71974999999999)[data, which has auto-increment keys into](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=115.6216) [Spanner, poses a challenge. Your choice of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=118.83466666666666) [keys should also inform how you load your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=121.720375) [data. Avoid writing those in order of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=124.22662499999998) [primary key. Consider partitioning your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=127.412) [key range and then writing in batches,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=129.87600000000003) [which are drawn from different parts of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=132.22742857142853) [those key ranges. The idea is to allow](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=134.71771428571432) [writes to be as well distributed across](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=137.28649999999996) [nodes as possible. Some best practices on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=139.91559999999998) [row size. In general, do not allow your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=143.57333333333335)[rows to balloon out of control. Keep your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=146.07974999999993) [rows to 4GB or less. This includes not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=148.72357142857143) [only the top-level parent table row, but](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=152.05699999999996) [also all of the interleaved child rows and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=154.58737499999998) [all of the associated index rows. You](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=157.552) [should try to be as proactive as possible](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=160.318125) [in using interleaved tables and in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=162.24471428571428) [specifying parent-child relationships.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=164.643) [Interleaved tables allow Spanner to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=167.388) [physically collocate parent and child](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=169.966) [table rows. This creates a hierarchy of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=172.50814285714284) [interleaved tables. The more information](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=175.5157142857143) [you can give Spanner, the better. It helps](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=177.23471428571432) [Spanner to reduce hotspotting. One](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=180.43249999999998) [especially attractive use case for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=182.74266666666668)[interleaved tables is for indices on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=184.456) [monotonically changing data to not create](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=187.378) [any non-interleaved indices on such data.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=190.317) [It is fine, however, to use interleaved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=193.116) [indexes even with monotonically trending data.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=8&mode=live&start=195.308)

[Creating and Managing Instances Using the Web Console - I](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live)

[We've covered a lot of theoretical ground,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=1.117) [and we are finally ready to get started](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=3.276) [with some demos. Let's see how we can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=5.218) [create and manage Cloud Spanner instances](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=8.404) [from the web console. Navigate to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=10.899) [console.cloud .google .com. That's the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=14.340600000000002" \t "psplayer) [usual starting point. Enter your email ID](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=17.0108) [and then your password. All of these steps](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=20.034499999999994) [are exactly as usual. The project that you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=23.1945) [are working in will be displayed up top,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=25.237000000000002) [and the navigation menu is at the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=27.485714285714288) [top-left. In the navigation menu, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=30.226714285714284) [first order of business is to enable APIs](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=32.1485) [for many services, which we plan to use.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=34.638200000000005) [The Google Cloud Platform intentionally](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=38.252) [keeps these off by default to prevent any](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=40.199) [unexpected or unanticipated use and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=43.119) [disputes over billing. That's fine. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=46.204) [will just go through and enable the APIs](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=48.491875) [for a bunch of GCP services, which we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=50.760125) [be accessing in this class. So in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=53.412857142857135) [navigation menu, select APIs and Services](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=56.21457142857141) [and Library. That brings us to a search](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=59.14933333333333) [page. Here we enter Cloud Spanner because](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=61.58714285714285) [that's the first API that we wish to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=63.792714285714304) [enable. This is simple enough. If we click](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=66.67525) [on it, it takes us to a detail page where](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=68.50654545454546) [we have a big blue Enable button. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=70.83466666666665) [click that, and that's all there is to it.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=74.044) [We are now taken to an overview page where](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=76.52555555555556) [they are some additional details. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=79.43942857142856) [also go ahead and enable the APIs in this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=82.05266666666667) [project for various other services. So the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=84.54166666666666) [Google Cloud APIs, this is a metaservice,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=87.18625) [which is used by many other services under](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=89.26085714285713) [the hood. Later on in the course, we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=92.16050000000001) [be using Cloud Dataflow, along with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=94.63888888888891) [Spanner, so let's enable that as well. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=96.97919999999999) [search for Dataflow and then enable the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=99.418125) [Dataflow API. Similarly, let's go ahead](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=101.4) [and enable the Cloud Functions APIs and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=104.199) [the Cloud Source Repositories APIs. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=107.57650000000001) [is a one-time exercise project. So if](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=111.3505) [you're using an existing project, you probably will not need to do all of this.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=9&mode=live&start=114.4012857142857)

[Creating and Managing Instances Using the Web Console - II](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live)

[After enabling all of the necessary APIs](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=0.989) [for this course, we are ready to get](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=3.28) [started. Search for Spanner in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=5.539555555555557) [navigation menu and click on the Create](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=7.472) [Instance button. We are prompted for an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=10.592000000000004) [instance name and are then prompted for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=13.175374999999999) [the instance configuration. Note that the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=15.792714285714284) [default instance configuration is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=17.866400000000006) [regional. Let's choose a region. Let's say](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=19.75866666666667) [us-central1. Note how the cost for the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=23.753999999999998) [nodes and the storage depend on the region](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=26.000000000000007) [that we select. We'll discuss Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=28.235875000000007) [pricing in detail, but check out how nodes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=30.301500000000004) [cost $ .90 an hour, and storage cost $ .30](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=32.97449999999999) [/GB/month. Nodes are effectively pay what](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=37.48049999999999) [you allocate. Storage is pay what you use.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=40.151999999999994) [These costs increase significantly if you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=43.143) [change the configuration to multi-region.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=45.011) [Here selecting the configuration in itself](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=48.57) [is a little more complex. Currently, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=51.408) [configuration supported are called nam3.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=54.09759999999999) [That stands for not America 3. The other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=56.453250000000004) [instance configuration is called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=59.71666666666666) [nam-eur-asia1. Both nodes and storage are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=61.016) [much more expensive with multi-region than](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=65.307) [with single-region configuration. Nodes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=67.61300000000001) [cost $3/hour in nam3, and storage costs $](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=70.8884) [.50 /GB/month. And in case you're](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=75.55599999999998) [wondering what this nam3 is all about, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=77.57471428571426) [details are over on the right. Nam3 will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=79.85622222222224) [store your data in the United States in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=82.7875) [Northern Virginia and South Carolina. Next](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=85.78099999999999) [is the node count, and there is some nice](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=88.17071428571428) [guidance there are on how you select the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=91.09649999999996) [number of nodes. The rough rule of thumb](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=93.31600000000003) [is that each node can provide 10, 000 QPS](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=95.30677777777781) [of reads, 2, 000 QPS of writes, and hold](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=98.08585714285715) [2TB of data. Because this is our first](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=102.06779999999998) [instance, we have a node count of 1. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=104.68050000000001) [are ready to hit Create. That really is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=107.48066666666668) [all there is to it. The instance will be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=109.81200000000001) [provisioned, and it will show up in our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=112.47139999999997) [instance dashboard. We can monitor the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=115.26766666666671) [instance using that monitoring tab over](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=117.06500000000003) [there, metrics, such as node count, CPU](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=119.0882) [utilization, and so on. Now that our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=121.92744444444443) [instance is coming to existence, let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=124.17042857142859) [explore some of the other things that we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=125.63642857142857) [could do with it. If we select the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=127.95028571428573) [instance, a menu appears on the right for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=130.11200000000002) [permissions and labels. Permissions allow](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=133.01714285714283) [us to add new members and to assign roles](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=134.85175) [to them. These could be either individuals](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=137.86960000000002) [or service accounts. Currently, there is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=140.63383333333337) [one owner. This is spikeysales@](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=143.9342857142857) [loonycorn.com. In addition, there are four](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=147.38275) [editors. These are all service accounts,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=149.99050000000005) [which have been inherited from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=152.191) [project-wide settings. Let's hide that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=155.1331428571429) [info panel and see some of the different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=157.1616666666667) [ways in which we can edit our instance. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=159.4574) [select it and click on the Edit Instance](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=162.11055555555555) [button, and this allows us to change the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=164.379) [instance name and the node count. Remember](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=166.743) [that the instance configuration, i.e.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=169.2662) [whether this is a regional or a multi-](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=171.36177777777777) [region instance, that is immutable. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=173.72) [cannot change that after the instance has](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=176.44542857142858) [been created. Let's change the number of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=178.39142857142858) [instances from 1 to 2. Notice that the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=180.769) [cost of the nodes doubles. The storage](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=183.293) [cost is unchanged. Let's save these](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=185.92960000000002) [changes and move on to creating our first](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=188.563375) [database. This is easy enough to do. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=192.09099999999998) [click on that blue Create database button.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=194.253875) [Let's call this the spikeysales-database.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=196.584) [That's the name of our database. The next](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=199.064) [item is to--- And there it is. It's ready,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=201.6974) [and we can now create tables in this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=204.65500000000006)[database. Let's go ahead and create a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=207.6061666666666) [simple table, which we'll call](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=209.81949999999995) [spikey\_test\_table. We can also add columns](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=213.07175" \t "psplayer) [using this nice UI. For each column, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=216.0033333333334) [can specify the name, the type, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=219.02150000000003) [whether null values are allowed or not.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=221.50771428571431) [We'll create a couple of columns. These](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=224.28266666666664) [are the Name column and the Age column.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=227.21699999999998) [Name takes string values of up to 1024](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=229.817) [characters in length. Nulls are not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=233.152) [allowed. The Age column is of type INT64.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=235.97049999999996)[We hit Continue, and then this is worth](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=239.881) [commenting on. We are asked to set a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=242.583) [primary key. In Spanner, every table must](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=244.764) [have the primary key. That key could](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=247.803) [either be a single-column key or a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=250.2747142857143) [composite. Here we are going to go with a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=252.4443333333333) [single-column key, and that's going to be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=255.3616) [the Name column. At this point, we can hit](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=258.07600000000014) [Create, and our table has come into](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=260.85057142857136) [existence. We can also view the equivalent](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=263.47628571428567) [SQL by clicking on that little link there.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=265.8605) [I will call out the heading of this dialog](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=268.944) [box. This says Equivalent DDL. DDL is an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=271.7330999999998) [acronym for data definition language. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=275.93912499999993) [means that the SQL here is going to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=278.35966666666667) [actually define a table or a schema or](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=280.629) [change the structure of the database in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=283.53) [some way. On the other hand, SQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=285.315) [statements which query data or which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=287.97014285714283) [update or delete existing data are called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=290.035) [DML, or data manipulation language](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=293.343) [statements. DDL and DML are the two types](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=296.31716666666665) [of SQL statements. Let's keep going with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=300.8285000000001) [our exploration of the UI. Note how the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=303.50014285714286) [Name column has a little key icon next to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=305.47222222222223) [it. Notice that we can also click on the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=308.17983333333336) [Indexes button there to create or work](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=311.807) [with other indices. Lastly, there is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=313.8807499999999) [Data column, which we can use in order to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=316.3764285714286) [insert data into our table. Let's go ahead](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=318.75011111111104) [and insert our first row. We are prompted](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=322.06387500000005) [for each of the column values. We type](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=324.846) [those out and hit Save, and our first row](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=327.5745714285714) [is successfully inserted into this little](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=331.5305714285715) [test table. Let's go ahead and insert a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=334.1884) [few more rows. One little bit worth](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=337.3313333333333) [commenting on, when you hit Insert, there](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=339.6006666666666) [is a little checkbox there for an empty](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=341.56449999999995) [string. This is a safe, verifiable way of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=344.4854999999999) [importing empty strings into your data. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=347.9001249999998) [any case, we enter a couple more rows. And](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=350.9528888888889) [by the end of this exercise, we have three rows in our database.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=10&mode=live&start=352.9892857142857)

[Creating and Managing Instances Using the Web Console - III](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live)

[The primary key column has a special role](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=0.767) [to play in Spanner. Because data is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=3.012) [arranged by the primary key, it's very](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=5.151) [easy to filter on primary key values. Here](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=7.314000000000001) [check out how in the UI we can filter on a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=10.9982) [specific value by just typing it out.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=14.113666666666665) [Let's continue with our exploration of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=16.979) [Spanner's functionality. Let's edit the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=18.979) [schema. We are able to now add a column.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=21.541249999999998) [This time, the column we add is for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=24.02) [gender. It's a string column, and we are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=26.05466666666668)[going to have to permit nulls because we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=27.886333333333322) [already have preexisting data in our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=30.175571428571434) [table. So this Gender column is added](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=32.91700000000001) [successfully, but all of the old,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=35.416)[preexisting rows are going to have null](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=37.942) [values when it comes to this column. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=40.054) [change that. Let's go ahead and edit our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=42.991875) [rows so that we can change and add a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=45.28036363636364) [gender. This is one way of doing it. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=48.68563636363638) [can type in the gender painstakingly row](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=50.5175) [by row, but that's going to be difficult.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=52.544) [As we shall see, a far more efficient way](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=54.806) [of doing this is using an update query.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=57.04) [Spanner and most other relational](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=60.512) [databases will have special efficient ways](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=62.615333333333346) [of performing such bulk operations. These](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=64.94516666666667) [are implemented using a special kind of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=68.32028571428572) [transaction called partition DML](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=70.586) [transactions. Such transactions avoid](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=72.89800000000001) [database-wide locks. This is why bulk](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=75.26940000000002) [operations are so much faster than](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=77.33149999999998) [individual user DML operations. In any](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=79.66533333333332) [case, let's keep moving and run our first](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=83.0651111111111) [query. We click on the Query button up](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=84.998625) [top. That takes a to a nice, web-based UI](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=87.451625) [where we can type out our first very](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=90.29975)[simple query. We are simply doing the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=93.38) [SELECT \* from our spikey\_test\_table, but](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=95.7486666666667) [we are doing a LIMIT 100. We don't want](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=97.63824999999999) [more than 100 rows in the output. Pretty](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=101.18019999999999) [standard SQL functionality. Let's go ahead](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=103.804) [and run that query and see how things go.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=106.35299999999998) [The query results are displayed down](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=109.2237142857143)[below. But what's more interesting is the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=111.94266666666667) [explanation. We can see that the query](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=114.83985714285713) [took 3.45 milliseconds to run. There are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=117.17275000000002) [also statistics about the CPU time that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=120.25928571428571) [was spent executing this query and other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=122.75571428571429) [interesting implementation details, such](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=125.862) [as the relational operator tree, which was used by the underlying SQL engine.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=11&mode=live&start=127.874)

[Working with an Instance Using gcloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live)

[In the previous demo, we used the web](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=0.971) [console to interact with our Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=2.774) [instance. This time, let's go ahead and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=4.870571428571428) [use the gcloud command line utility](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=6.525000000000001) [instead. Hopefully you have encountered](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=9.421600000000002) [the Google Cloud Shell before. In case you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=11.387000000000002) [haven't, this is a simple and easy way to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=14.132000000000003) [interact with the GCP from a terminal](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=16.850333333333335) [window, which happens to run from inside](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=19.66014285714285) [your browser. You simply click on that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=22.45649999999999) [little icon over in the top-right, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=24.598374999999994)[says Activate Cloud Shell. This will open](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=27.134500000000003) [a terminal connection on an ephemeral VM.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=29.656750000000002) [It's important that you not use Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=31.936714285714285) [Shell for any long-running commands](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=35.06766666666667) [because this ephemeral VM will time out](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=36.93066666666667) [your sessions every half an hour or so.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=39.3495) [The great thing about this VM is that it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=41.75344444444445) [will have all of the latest versions of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=44.55325) [different services and Google Cloud SDKs](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=46.72833333333334) [installed. The first thing that I'd like](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=50.21633333333334) [to do once Cloud Shell does open up is to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=51.972666666666655) [just change the prompt. The current prompt](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=54.7132222222222) [is a bit too verbose, and it's not going](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=56.978125) [to allow me to display all of my commands](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=59.245999999999995) [clearly. So I'm going to run this little](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=62.02257142857141) [bit of Shell script to change to something](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=63.52288888888888) [much more succinct. A little more](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=65.71085714285718) [housekeeping and start by running gcloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=68.96016666666668)[auth application-default login. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=71.40299999999998) [not really needed from the Cloud Shell.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=74.61411111111111) [But if you're using the GCP from your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=76.312) [local machine, this is important. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=78.63911111111109) [process will require you to test a link](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=81.58125) [into a browser. Sign in with whatever](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=83.69425) [email ID you are using. This, in turn,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=86.58355555555556) [will give you a verification code. You](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=89.52733333333332) [copy-paste that verification code back](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=92.02966666666666) [into Cloud Shell, and then you are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=93.998) [verified. Your credentials will be saved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=97.09637499999997) [on that Cloud Shell machine in a temporary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=98.92542857142855) [file, and you are ready to start using the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=101.34342857142853) [GCP in earnest. Another command that might](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=104.38563636363631) [be useful if you're using your local](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=106.31628571428573)[laptop, you need to get the latest version](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=108.32399999999998) [of all of the components. So you run sudo](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=110.72533333333332) [gcloud component update. This is a good](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=114.40185714285717" \t "psplayer) [way of making sure that you have the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=117.00260000000002) [latest up-to-date Google SDK components.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=119.45557142857142) [Now, finally, we can start interacting](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=122.402) [with Spanner. Let's run our first simple](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=125.29700000000001)[command using the gcloud non-interactive](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=127.87271428571425) [shell. So this starts with gcloud spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=130.73924999999997) [followed by the individual command. Here](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=133.55171428571433) [we would like to list all of the different](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=135.61122222222224) [instance configurations. And here we can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=138.09466666666668) [see, nam-eur-asia1, nam3, and the other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=141.9871428571429) [multi-regional and regional instance](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=144.84750000000003)[configurations. Let's run a simple command](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=147.25150000000002) [to create a new instance called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=149.9975555555556) [spikey-test-spanner. It will make use of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=153.09799999999998) [the same nam3 configuration as before. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=155.35650000000004) [also specify a description and the number](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=158.44957142857143) [of nodes, which we set here to be just 1.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=160.8831111111111) [Once the instance creation is done, we can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=163.66142857142856)[switch back to the web console, refresh](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=166.63712499999997) [our Spanner dashboard, and we can see that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=168.9384) [our Spikey Test Spanner instance appears](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=171.6744444444445) [there. To do the same from the command](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=174.14866666666666) [line, simply run gcloud spanner instances](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=176.38012500000005) [list. And once again, we will get](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=179.43216666666672) [information about both of our instances.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=181.42571428571432) [It's also easy enough to use the command](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=183.972) [line to update the description or even to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=186.218) [increase the number of nodes. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=189.731) [increase the number of nodes from 1 to 2,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=192.73975000000002) [and that is reflected in the web console](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=194.85244444444444) [dashboard as well. And to delete an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=197.8075) [instance, simply run gcloud spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=201.12759999999997) [instances delete followed by the name of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=203.39099999999996) [the instance. Here we are deleting](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=206.3685714285714) [spikey-test-spanner. We hit Yes when we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=209.55600000000004) [are prompted for a confirmation. And then](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=211.71250000000003)[next time we list the instances, spikey-test-spanner is gone.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=12&mode=live&start=213.91525000000001)

[Pricing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live)

[Let's take a look at how pricing works for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=0.963) [Cloud Spanner. The cost of your Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=3.136) [instance is going to depend on three](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=6.031) [variables, the number of nodes used, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=7.807) [amount of storage used, and the amount of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=11.385375) [network bandwidth that you consume. At a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=13.863833333333334) [very high level, you pay for nodes based](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=16.791111111111114)[on what you allocate; you pay for storage](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=19.111875) [based on what you consume. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=21.324) [double-click on each of these components.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=24.31414285714286) [The number of nodes is driven by the node](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=27.315) [cost. Every hour Spanner will calculate](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=30.11849999999999) [the maximum number of nodes that was in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=32.74999999999999) [existence in the instance in that hour and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=35.443)[then multiply it by an hourly rate.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=37.834) [Effectively, each node is billed for a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=40.73) [minimum of 1 hour. How much is the hourly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=43.066) [rate? Well, that depends on whether the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=47.27079999999999) [configuration is regional or multi-](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=49.15) [regional, and the differences are not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=51.515) [small. As of the making of this video,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=54.36242857142858) [which is in November of 2018, the hourly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=56.734) [rate for regional configurations varies,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=59.909666666666666) [but it's roughly in the ballpark of $ .90](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=61.971875000000004) [to $ 1.10 per node per hour. The hourly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=65.41999999999999) [rate for multi-regional configurations is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=69.868) [significantly more expensive. Currently,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=72.389) [that is in the range of $ 3.00 to $ 9.00](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=74.9607) [/node/hour. This is a steep cost.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=79.19924999999999)[Forgetting to delete or turn down your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=83.148) [Spanner instances is one of the most](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=85.32) [expensive mistakes that you could make on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=87.431) [the Google Cloud Platform. Now let's talk](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=89.381) [about the storage cost. This is billed for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=92.93900000000001) [the space that's used by tables, secondary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=95.29544444444443) [indices, as well as overhead associated](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=97.33833333333334)[with those indices. This storage cost also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=100.593) [varies based on your instance](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=103.81549999999999) [configuration. For regional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=106.0295) [configurations, it's in the range of $ .30](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=107.412) [to $ .40 /GB/month. For multi-regional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=110.74450000000002) [configurations, it goes up to between $](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=114.28633333333333) [.50 and $ .90 /GB/month. And you can see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=116.809) [that that is orders of magnitude more](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=120.23499999999997) [expensive than a Google Cloud Storage](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=123.28414285714285) [multi-regional bucket, which currently](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=126.21900000000001) [costs only $ 0.026 /GB/month. And the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=127.8698) [third component of Spanner pricing is the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=132.17314285714292) [amount of network bandwidth that you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=135.14749999999998) [consume. As always, there's a lot of fine](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=137.69975000000002) [print. Networking costs are amongst the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=140.02487499999995)[most difficult to estimate. The simple](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=141.6608333333333) [rule of thumb is that ingress is free,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=144.01477777777777) [while egress varies widely in its cost. A](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=146.70387499999998) [couple of other points worth keeping in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=151.70366666666666) [mind. There is no additional charge for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=153.52714285714285) [import or export of data, so at least this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=156.02271428571427) [bit is free. If you make use of Dataflow](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=159.75614285714286) [workers or GCS buckets as a sort of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=162.90600000000003) [adjunct staging area for your data, standard pricing for those will apply.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=13&mode=live&start=165.34062499999996)

[Summary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live)

[We've now come to the end of this, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=0.952) [first module, in our course. This module](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=2.821833333333333) [was all about getting started with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=5.175428571428571) [Spanner, which, of course, is a powerful](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=6.829400000000001) [proprietary Google RDBMS. We saw how](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=9.850000000000001) [globally distributed Cloud Spanner is and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=12.9565) [how it manages to offer horizontal](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=15.176124999999999) [scaling, along with strong consistency](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=17.3948) [guarantees. This is a very rare and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=20.4165) [unusual combination, which makes Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=23.267000000000003) [virtually unique. Spanner is also fairly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=25.99166666666667) [expensive. The cost of Spanner includes a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=29.386999999999997) [node cost, which is pay what you allocate,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=31.838750000000005) [and storage cost, which are pay what you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=34.516) [use. So you should be careful and not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=37.04844444444442) [leave your Spanner instances lying around.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=38.84122222222222) [Delete them as soon as you're done with them.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=e8d73cbd-ca70-46be-8d8d-95d016e5679a&clip=14&mode=live&start=41.789)

[Creating and Managing Tables in Cloud Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live)

[Module Overview](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live)

[Hello, and welcome to this module in our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=0) [course on Cloud Spanner. This module is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=3.451) [all about creating and managing tables in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=6.183000000000001) [Cloud Spanner. We will begin by](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=8.838) [understanding what interleaved tables are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=10.895666666666667) [and the semantics of on delete cascade. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=12.779857142857143) [will move on to programmatic access from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=16.230499999999996)[Python, and we will see how this can be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=19.824250000000003) [done for different types of transactions,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=22.255000000000003) [read-only and read-write. We will then](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=24.544) [move on to secondary indices. These exist](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=28.438750000000002) [outside of the primary index of a table.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=30.911) [We will understand how commit timestamps](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=33.91014285714286) [can be used in situations where an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=36.123714285714286)[application is fine with a certain amount](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=38.82457142857143) [of staleness in the data, but does not want latency at any cost.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=0&mode=live&start=41.4905)

[Interleaved Tables and Cascading Delete](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live)

[Let's go ahead and get started with a demo](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=1.056) [in which we will see how interleaved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=3.338) [tables are created and how cascading](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=5.079250000000002) [delete statements work with such tables.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=7.7713333333333345) [Let's start with our Spikeysales Instance.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=11.245) [If we click on this, we see that there is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=14.784) [a spikeysales-database. Let's go ahead and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=16.346727272727275) [add a table in there. Let's call this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=19.87322222222223) [table spikey\_customer\_details. Let's add a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=22.211) [bunch of columns. The first column is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=26.560500000000005) [CustomerID. This is going to be the key](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=29.441999999999993" \t "psplayer) [column. After that, we will go ahead and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=32.057750000000006) [add in a bunch of other columns, such as](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=33.75769999999999) [FirstName, LastName, Gender, and so on.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=36.487571428571435" \t "psplayer) [Once we are done, let's hit Continue, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=40.241) [then we specify our primary key. At this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=42.769285714285715) [point, we have a single column key, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=45.59588888888889) [is the CustomerID. Let's hit Create. That](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=47.73375) [will bring our Customers details table](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=50.39342857142857) [into existence. Next, let's go ahead and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=53.5058) [insert a bunch of rows so that we can do](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=56.28722222222224) [something meaningful. Now, of course,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=59.434) [there are several ways of getting data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=60.778000000000006) [into a table. One of these is to use this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=62.6818) [Insert button here and actually type all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=66.07400000000001) [the values, another is to use an insert](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=68.39014285714288) [query, and a third is to use the command](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=71.44614285714283) [line, to use gcloud spanner, along with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=74.0917777777778) [the insert command. Okay, now we can get](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=76.31785714285716) [started with the interesting stuff. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=79.26) [click on the CREATE TABLE command, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=81.79457142857143) [let's select the Edit as text option. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=84.584) [can now paste in a CREATE TABLE command.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=87.69955555555556) [Note that this is a table called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=90.336) [spikey\_order\_details followed by a bunch](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=92.371" \t "psplayer) [of column definitions. This includes the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=95.096)[CustomerID, by the way, and then for a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=97.773) [PRIMARY KEY, which is a composite key,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=100.75) [which includes both the CustomerID and the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=102.995) [OrderID. And finally, for the most](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=106.48100000000004" \t "psplayer) [interesting part of this table definition,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=108.36828571428572) [we are interleaving this table. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=110.497) [the spikey\_order\_details table with a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=113.96833333333333) [parent table. The parent table is the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=115.98775) [spikey\_customer\_details table. And there](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=118.583" \t "psplayer) [is, of course, a parent-child relationship](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=121.69485714285715) [inherent in this interleaving, so we need](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=123.7982) [to also specify the delete semantics. Here](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=127.04033333333334) [we go with the ON DELETE CASCADE option.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=129.65744444444445) [We hit Create, and our first interleaved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=133.037) [table is about to come into existence.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=135.384) [Notice how the primary key of the parent](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=137.968) [table is a prefix of the primary key of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=139.847) [the child table. Let's go ahead and insert](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=142.4390000000001)[some data. As usual, we will do so by](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=145.359) [clicking on that Insert button. Now we've](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=147.836) [got to enter values for both the columns](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=150.48888888888888) [of the primary key of the parent, that's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=153.25324999999998) [CustomerID, and also the primary key of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=155.74528571428573" \t "psplayer) [the child, which is OrderID. There's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=158.63216666666665) [nothing particularly remarkable about](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=161.17675) [inserting rows into an interleaved table,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=162.96866666666665) [so we go ahead and insert a few more rows](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=165.4639) [exactly as before. When we are done, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=168.54000000000002) [can switch to the command line and run a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=171.43588888888883) [simple SELECT query and examine the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=173.86624999999998) [contents of our child table. This is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=176.20437499999997) [simple SELECT \* from spikey\_order\_details.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=179.15171428571432) [By this point, we have inserted four rows,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=182.405) [and all of these appear. Let's move down](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=184.639) [one of these CustomerIDs at random. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=187.34766666666667) [call it the first one. That's AG-10270.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=189.57866666666666) [Then let's go to the Customers table and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=192.36442857142856) [delete that particular row. Now we had](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=198.19871428571432) [specified the delete semantics as ON](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=201.51200000000003) [DELETE CASCADE. So if we delete this row](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=203.57555555555555) [from the parent table, the corresponding](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=206.304) [rows from the child table should vanish as](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=208.8091428571429) [well. Let's see if that happens. Let's run](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=211.96749999999997) [a DELETE statement in which we are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=214.502) [explicitly deleting from the table](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=216.71533333333332) [spikey\_customer\_details for the key value](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=218.482" \t "psplayer) [AG-10270. And when we hit execute, there's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=224.95200000000006) [no response from Spanner, so hopefully it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=228.52020000000002) [was successful. Let's switch back to the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=230.97659999999996) [web console and confirm. And indeed, that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=233.49411111111107)[particular row has vanished from the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=235.63900000000004) [customer\_details table. Let's now see what](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=238.4956" \t "psplayer) [happens in the child table. So let's click](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=240.92933333333332) [on spikey\_order\_details and navigate to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=243.485) [the Data tab. And there we now see that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=245.60899999999998) [the child row is gone as well. There's no](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=248.46439999999998) [row in our child table corresponding to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=251.02022222222217) [the foreign key that we just deleted. The](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=253.43557142857142) [on delete cascade has clearly worked. Now](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=256.6275) [we mentioned that Spanner supports](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=259.429) [interleaving up to seven levels of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=261.478) [hierarchy. So let's go ahead and see how](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=264.16066666666666) [we could create another further level of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=266.15466666666686) [nesting. We will add a table called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=269.2613333333334)[spikey\_supplier\_details. This will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=271.133) [reference both the Orders table and the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=274.0925714285714) [Customers table. So in this way, we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=276.7405) [have three levels of nesting. To see how](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=279.0466666666667) [this is done, let's switch to the command](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=281.025875) [line. Let's clear our terminal and type](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=283.16816666666665) [out the query. This is a fairly involved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=285.78566666666654) [query. Notice that it uses the DDL update](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=288.5995) [key word. The rest is fairly standard. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=291.67766666666677) [have a CREATE TABLE statement with the ddl](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=293.99925) [flag in there, the table name, that's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=297.02714285714285)[spikey\_suppliers\_details. The interesting](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=300.81600000000003) [bit is that the primary key is now a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=302.60875) [composite of three attributes. That's the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=305.4588571428572) [CustomerID, the OrderID, and the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=308.167" \t "psplayer) [SupplierID. Notice also how the order of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=310.80449999999985" \t "psplayer) [these keys is important. The primary key](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=313.94799999999987) [of the parent table is the first. It](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=316.7891) [serves as a prefix, then comes the OrderID](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=319.649) [column, and finally is the SupplierID.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=322.35928571428576) [This order of the keys in the composite](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=326.021) [primary key is very important. And finally](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=328.118) [is the interleave statement, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=331.8706666666667) [INTERLEAVE IN PARENT. Notice how we only](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=334.0755) [specify the immediate parent,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=336.74371428571425) [spikey\_order\_details. And last of all, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=338.86" \t "psplayer)[specify the delete semantics to be ON](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=341.3455000000001) [DELETE CASCADE. We execute the command,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=344.2549999999999) [and it goes through successfully. As](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=346.5787777777777) [always, the return value is a bit cryptic.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=348.5057777777778) [But to confirm the results, we switch back](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=351.384) [to the web console, check in our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=353.464) [spikeysales-database, and there, sure](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=355.32" \t "psplayer) [enough, we see the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=357.695) [spikey\_suppliers\_details table has](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=358.783" \t "psplayer) [appeared. We have successfully](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=361.61199999999997) [demonstrated the creation of interleaved](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=363.5006) [tables with three levels of nesting and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=365.3835) [also seen how the ON DELETE CASCADE semantics work.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=1&mode=live&start=368.08177777777775)

[Types of Reads](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live)

[Let's spend a little bit of time talking](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=0.579) [about the two types of reads supported in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=2.496) [Cloud Spanner and their use cases. Now for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=4.53) [context, remember that Spanner is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=8.23225) [horizontally scaled and replicated](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=10.132) [relational database, which means that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=12.759) [there are multiple replicas of the splits](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=14.616499999999997) [that we've discussed earlier. These](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=17.300571428571434) [replicas need to be kept in sync. Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=19.793875) [offers a strong form of consistency called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=23.047) [external consistency, which ensures that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=26.028) [no client need ever read stale data. But](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=28.366750000000003) [what if you have a client, which is fine](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=31.469000000000005) [with reading some slightly stale data? In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=34.83642857142857) [order to support this, Spanner has two](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=37.257) [different types of reads. The first kind](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=40.43785714285715) [of read is called a strong read. Here the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=43.6278) [reading application will want to see all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=46.30071428571429) [of the rights that have been written to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=48.361749999999994) [the database so far. Now a write will only](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=50.54900000000001) [be committed after the Paxos consensus](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=53.64862500000001) [algorithm has played out, so this may be a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=55.605000000000004) [little slow. If your application is not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=58.94250000000001) [okay with that latency, but it is okay](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=61.49525000000001) [with slightly stale data, you can opt for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=64.566375) [a stale read. This is meant for apps,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=67.98262500000003) [which are tolerant of stale data, but](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=70.45174999999998) [which are very critical to latency. Now](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=72.6995) [it's important to note that, by default,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=75.48328571428571) [all reads are strong. So by default, your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=78.53814285714286) [app will only be getting the latest data,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=81.50749999999998) [which includes all committed writes. Based](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=84.20885714285717) [on what type of read you want to go with,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=87.10840000000002) [there are actually three different types](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=90.455) [of read operations. Your use case may or](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=92.12814285714289) [may not require transactional support. If](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=95.42137500000004) [it does require transactional support,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=98.55016666666667) [there is a further choice. If you are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=100.211) [going to perform a write based on the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=103.29166666666667) [results of one or more reads, then your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=105.7085) [workload is a read-write transaction. On](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=108.79528571428573) [the other hand, if you are only going to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=111.7337) [read data, that is if you're going to make](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=113.513) [multiple reads that require a consistent](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=115.691) [view of the data, you should go with a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=118.366) [read-only transaction. Note that both](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=120.439) [read-write and read-only are still](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=123.60457142857143) [transactional. This means that they will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=126.272)[require a consistent view of the data. Now](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=128.4287142857143) [there are also use cases which are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=132.04044444444443) [non-transactional. These can be dealt with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=135.03255555555546) [using a single read method. For instance,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=137.20849999999996) [a single standalone read call or multiple](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=139.78300000000002) [such independent read calls, which are not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=142.72466666666668) [going to read data across different row,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=145.119625)[these do not require transactional support](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=147.112) [at all. Let's now try and tie together](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=149.984) [these two different concepts, the three](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=152.7695) [types of operations and the two types of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=154.6733333333333) [reads. Let's say that we are performing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=158.26) [either a read-only transaction or a single](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=160.3125) [read method. We can specify a timestamp](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=163.2511428571428) [bound. This timestamp bound determines](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=167.09633333333338) [whether we are going with a strong read or](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=168.9373333333333) [a stale read. In other words, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=171.65180000000007) [timestamp bound tells Spanner how to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=173.56685714285712) [choose which data to return. We might to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=175.78937500000004) [allow some staleness in return for lower](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=179.46075000000002) [latency. If this tradeoff is acceptable,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=182.15471428571428) [we will go with a stale read. By default,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=184.126875) [the timestamp bound specified is strong.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=187.95766666666668) [This is what you would use for a strong](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=190.26677777777778) [read. For stale reads, you have two](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=193.19366666666664)[choices. You could either specify bounded](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=195.6615) [staleness, or you could ask for an exact](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=198.012) [timestamp bound. This is equivalent to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=201.263) [requesting a specific state from the past.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=203.053) [As a cloud architect, you should use](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=207.001) [timestamp bounds wisely. You should be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=208.718) [willing to accept some staleness when](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=211.67271428571428) [latency is more important. And you should](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=213.717) [go for exact timestamps whenever it's important that you get the latest data.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=2&mode=live&start=216.9265714285714)

[Table Schema Definition](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live)

[Let's move on to a demo in which we'll see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=1.195) [how Python can be used to carry out schema](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=3.064) [definition and CRUD operations. CRUD, of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=5.927) [course, is an acronym for create, read,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=8.89525) [update, and delete. Now by far, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=11.131499999999999) [simplest way of using Python on the Google](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=13.859800000000003) [Cloud Platform is from Cloud Datalab. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=16.229750000000006) [is a way to run hosted Jupyter Notebooks.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=19.64188888888889) [These are hosted on a cloud virtual](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=22.841) [machine instance. All that you need to do](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=25.49011111111111) [in order to get started is to run this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=27.442800000000005) [simple command, datalab create followed by](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=30.13071428571429) [the name of the VM that you want to host](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=32.417) [your Datalab instance and the zone in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=35.64049999999999)[which that instance is to be created.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=37.68428571428572) [Datalab is a very powerful tool. It allows](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=40.842" \t "psplayer) [you to run hosted Jupyter Notebooks on a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=43.410000000000004) [cloud VM instance. So we go ahead and run](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=46.2495) [this command, and a whole bunch of stuff](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=49.455250000000014) [happens behind the scenes to provision](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=51.291249999999984) [that VM instance and install the Datalab](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=53.22442857142856)[container on it. As an aside, you might be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=56.29614285714286) [interested to know that Datalab is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=58.68725000000001) [actually a Docker container, which is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=60.47899999999999) [running on this particular server. In any](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=62.585) [case, if we now navigate to the Compute](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=64.79) [Engine tab, we will see our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=67.75166666666664) [spikey-spanner-datalab instance there,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=70.71119999999998) [just like any other VM instance that we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=71.98914285714287) [might have created. Our Datalab Docker](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=75.25049999999999) [container accepts incoming connections on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=77.88200000000002) [a specific port. To hit that port, just](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=80.662) [click on that little eye icon in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=84.0438888888889) [top-right. Let's go ahead and click on it.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=87.41419999999998) [This also allows us to change the code on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=89.617) [which the container is listening if we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=92.082) [want. 8081 is the standard. Let's go ahead](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=94.43487499999996) [and connect on it. This opens up a browser](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=98.193) [window. In this browser window, we can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=101.88449999999997) [effectively navigate the filesystem of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=103.65342857142859) [this VM instance. Here let's click on the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=106.04571428571427) [notebooks folder. This is where we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=109.85499999999999) [create the Jupyter Notebooks that we are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=112.063375) [going to work with. So we add a new](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=113.89650000000003) [notebook, and now we are in business. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=116.32816666666665) [can type Python code here. This is an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=118.69083333333333) [untitled notebook, so we can name it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=121.32050000000001)[something meaningful, like](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=123.07749999999999) [WorkingWithCloudSpanner. Now Datalab](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=125.19649999999999" \t "psplayer) [supports both Python 2 and Python 3. By](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=127.38771428571428) [default, it's Python 2. Let's change the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=130.7224285714286) [kernel to Python 3 in that dialog box in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=133.21566666666664) [the top-right. We can now go ahead and use](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=136.87499999999997) [pip install followed by the client library](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=140.14655555555555) [names, exactly as we would with a Jupyter](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=142.6126666666666) [Notebook. The first library we want to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=145.80100000000004) [install is google-cloud-spanner, and then](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=147.81049999999996) [we are in business. We can start with the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=149.90185714285718)[import statements. We can instantiate a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=153.8535714285714) [spanner\_client. We can create variables](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=156.32900000000004" \t "psplayer) [with our instance\_id. And we are now ready](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=158.46399999999994) [to connect to a database and start running](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=160.57088888888887) [some queries. Before we do that, let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=163.12666666666664) [switch back to Cloud Spanner and create a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=165.14675000000005) [new database called spikey-test-database](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=167.40528571428572) [and load it with some data, which we can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=169.25779999999997) [use for these operations. We are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=173.44700000000003) [intentionally only creating an empty](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=175.71271428571427) [database from the web console. We will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=177.412) [then go ahead and populate this and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=180.07433333333333) [perform all of our table definitions and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=181.493) [CRUD operations from Python. So we are now](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=183.839) [ready to switch back to our Datalab](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=187.90780000000004) [notebook. We will point our instance to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=189.46633333333332) [this particular database. So the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=192.5992) [database\_id is spikey-test-database. Once](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=195.4318" \t "psplayer)[we have a reference to this, we can go](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=197.6668) [ahead and run some create\_table commands.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=199.816) [The syntax for this create\_tables command](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=203.204) [is fairly straightforward. All we really](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=205.45) [need to do is to embed our SQL statement](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=208.56390000000002) [inside a method call to the update\_ddl](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=211.03325) [method on the database object. Do notice](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=214.35016666666667) [that we are basically repeating the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=218.74328571428575) [creation of the interleaved tables, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=220.48166666666668) [we had previously done from the web](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=222.46311111111112) [console. We have a spikey\_customer\_table](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=224.68988888888887) [and a spikey\_product\_details table, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=226.672) [the two are interleaved. This is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=229.3328) [blocking call, so the result of this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=233.27200000000005) [particular DDL operation will only come](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=235.97571428571436) [back after it's been executed. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=238.1054285714286) [invoke this create\_tables function and see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=240.75099999999998) [what happens. We hit Ctrl+Enter as usual.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=243.78100000000003) [It takes a little while for the operation](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=246.798) [to complete, but eventually it goes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=248.709) [through successfully. If we switch to the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=251.37224999999995) [web console, navigate to Spanner, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=253.52428571428575) [check in our Spikeysales Instance, we find](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=255.2825714285714) [that this spikey-test-database now,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=257.99666666666667) [indeed, has a couple of tables. We have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=260.25333333333333) [successfully demonstrated table creation from Python.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=3&mode=live&start=263.65759999999995)

[CRUD Operations](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live)

[Let's pick up right from where we left](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=1.301) [off. We had created a couple of tables in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=3.269888888888888) [the spikey-test-database. Now let's see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=5.281333333333332) [how we can insert data into these tables.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=7.994333333333333) [Here we have an insert\_data method in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=10.378714285714286) [which we create a batch of rows, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=13.688444444444444) [have to be inserted into the database all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=17.003375) [together. Cloud Spanner is going to apply](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=19.22714285714286) [statements from the same batch in order.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=21.701375) [And if a statement is in error, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=24.525) [previous statements will not be rolled](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=26.622249999999998)[back. In this case, important to know.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=28.759749999999993) [Next comes the table, which here is the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=31.171) [spikey\_customer\_table, along with the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=33.465" \t "psplayer) [columns, and finally and array of values.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=35.15) [So we are inserting multiple rows at one](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=38.215) [go. Let's now repeat this operation, but](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=41.309222222222246) [this time we will insert into the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=43.844875) [spikey\_product\_details table. We are ready](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=45.195" \t "psplayer) [to give this function a spin, so we invoke](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=48.791333333333334) [the insert\_data method, and this goes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=51.51250000000001) [through successfully. If we now switch to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=53.9592) [the web console and navigate to the Data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=55.98299999999999) [tab, we find that the rows we put in do](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=58.302111111111124) [indeed appear, both for the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=61.775999999999996) [spikey\_customer\_table and the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=63.825500000000005" \t "psplayer)[spikey\_products\_table. Let's switch back](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=65.155) [to Datalab and run a database.update\_ddl](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=67.932375) [statement. We will alter both of our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=70.9675) [tables and add columns. So we are adding a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=74.54840000000002) [Price\_Paid column to the product\_details](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=77.15537499999996" \t "psplayer) [and a Wallet column to the customer\_table.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=78.72414285714285) [Let's invoke this add\_columns method, wait](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=81.9708) [for the operation to complete, switch back](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=84.80300000000001) [to Spanner, and indeed, the Wallet column](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=87.77333333333335) [appears in the customer\_table with nulls](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=90.00185714285718) [for all of the rows, and the Price\_Paid](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=92.45614285714284) [column appears in the product\_details](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=95.96428571428575) [table, once again, with nulls in all rows.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=98.00874999999999) [Let's remedy those nulls. Let's switch](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=101.052) [back to Datalab and define an update\_data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=103.34525000000001) [method. Once again, we create a batch, but](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=105.766) [this time, it's an update statement, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=108.84071428571431) [we are going to run. We specify the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=110.804) [columns, CustomerId and ProductId, along](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=113.61914285714286) [with the values of the Price\_Paid. As long](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=115.92) [as we specify the key columns, that's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=119.78074999999998) [enough information for Spanner to know](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=121.6075) [which rows to update. And we can do the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=123.603) [same with the spikey\_customer\_table. We'll](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=126.24750000000002) [put in a wallet balance. We invoke this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=128.65783333333334) [update\_data method. It's gone through](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=132.24919999999997" \t "psplayer) [successfully. Let's switch back to the web](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=134.34400000000005) [console. And this time, the Price\_Paid](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=136.99085714285718) [column has all of the values we specified.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=138.84914285714288) [Likewise, the Wallet field is populated as](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=141.311) [well. Let's round this out by deleting](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=144.33062500000003) [some rows from Python. So we switch back](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=146.34000000000003) [and define a delete\_data method. The code](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=148.70649999999998) [for this method is pretty succinct. As](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=151.61075) [always, it takes a lot of effort to build](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=153.61133333333333) [and very little to destroy. The](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=155.78716666666668) [interesting bit here is that we create a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=158.12125) [keyset. This is an array with all of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=159.993) [keys which we wish to delete. We create a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=162.459) [batch with these keys, and that really is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=165.85985714285715) [all that there is to it. We give this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=168.31779999999995) [function a spin. We delete the data. And](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=170.82350000000002) [now when we go back to the product\_details](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=172.79311111111105) [table, the row that we deleted no longer](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=175.2244) [shows up. We have successfully implemented](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=177.9047777777777) [create, update, and delete commands from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=180.34900000000002)[Python. Now all that's left for us to do is to read.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=4&mode=live&start=182.78099999999995)

[Reading Data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live)

[Let's now jump into a series of demos in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=1.139) [which we will demonstrate reading from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=3.355) [Cloud Spanner. This time our function is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=5.322) [called read\_data. As always, we have a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=7.838) [with statement, but this time it's not a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=10.89) [batch; rather it's a snapshot. Now a batch](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=13.373) [is something which we use for update,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=17.161) [create, or delete statements because we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=19.0682) [want all of them to happen in order. A](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=21.676399999999997) [snapshot, on the other hand, represents](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=24.746000000000002) [the data which is within the database at](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=26.409000000000002) [any given point in time. We shall see in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=29.20157142857143) [later demos how it's possible to specify a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=32.49) [specific timestamp. If we omit a timestamp](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=35.70066666666666) [while creating the database.snapshot, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=38.43999999999999) [are effectively asking for the latest](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=40.708999999999996) [data. Now let's do this. Let's create a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=44.02359999999999) [keyset, which has all of the keys in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=47.30062499999998)[database and then pass this keyset into a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=50.01711111111111) [snapshot.read statement. In that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=52.67" \t "psplayer) [snapshot.read, we have to specify the name](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=55.804857142857145" \t "psplayer) [of the table, as well as the columns which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=57.80622222222222) [we wish to read. And this will return an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=60.03366666666667) [iterable called results. We can iterate](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=63.461500000000015" \t "psplayer) [over these rows and format them nicely.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=65.714125) [Let's go ahead and execute this by](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=68.76228571428571) [invoking the read\_data method, and it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=72.31066666666668) [nicely prints all of the data in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=75.01580000000001) [customer table. Remember that there are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=76.575) [two types of reads in Spanner, strong](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=78.973) [reads, which fetch the latest data, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=81.24285714285715) [stale reads, which are okay with some](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=83.689) [staleness. Let's check out an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=86.49599999999997)[implementation of a read of stale data.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=88.109) [This method is called read\_stale\_data, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=90.65685714285715) [here inside the body of the method, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=93.44633333333333) [import the datetime library and set the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=96.58071428571427) [staleness that we are okay with to be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=98.87899999999998) [equal to 15 seconds. This staleness object](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=102.31850000000003) [is merely a datetime.timedelta object, but](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=105.3485) [we pass this into our snapshot, and we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=108.11449999999999) [specify this as the value of the exact](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=111.62937500000001) [staleness, which we are fine to live with.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=114.58566666666665) [The rest of the code in this method is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=117.566) [pretty familiar. We create a keyset, pass](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=119.309) [that into a snapshot.read, and iterate all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=122.4212) [the results. Let's give this method a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=125.86860000000001) [spin, and we see that it does, indeed,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=128.1701111111111) [return all of the CustomerIds. Next, let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=130.92077777777772) [break into a method in which we read a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=133.46755555555552) [range of keys. This is something which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=135.99779999999998)[Spanner is able to do very efficiently,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=138.12050000000002) [and that's because all of the data is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=139.98271428571425) [stored in sorted order of primary key. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=142.56100000000004) [create a snapshot object as usual, but the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=145.4941428571429) [interesting bit is where we create a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=148.586) [spanner.keyrange. Notice that we have to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=151.80949999999996" \t "psplayer) [specify the start\_closed and the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=153.75771428571426) [end\_closed values. These are the bounding](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=156.2628" \t "psplayer) [points of the interval of the keyrange](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=158.8848571428571) [interval that we are seeking to read. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=161.3167142857143) [pass this keyrange into our keyset and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=164.519625) [then invoke the snapshot.read method. All](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=166.967) [of the rest of this is exactly as usual.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=170.4303) [The return values are only for the keys](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=173.016) [within the range that we specify. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=175.399) [round out this demo with a look at how](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=178.50066666666666) [read-only transactions can be implemented.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=180.87466666666666) [The only significant difference here is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=183.918) [that when we instantiate our database](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=185.91) [snapshot, we have to specify the multi-use](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=188.011) [parameter to be true. This is telling](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=191.564) [Spanner that we wish to carry out a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=194.36662500000003) [read-only transaction, and we have more](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=196.84399999999997) [than one read. All of those reads need to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=198.77942857142855) [be executed at exactly the same timestamp.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=201.44766666666663) [Once we do this, we can have multiple](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=204.848) [reads within the body of this with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=206.88533333333322) [statement, and these reads might either](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=208.99485714285714) [use the snapshot.execute\_sql method or the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=210.60542857142858)[snapshot.read method, which we have been](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=213.827) [using so far, and Spanner will ensure that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=215.887) [all of these use the same timestamp. We go](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=218.636) [ahead and execute this method, and we get](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=221.89028571428574) [results from three reads. All of these are part of the same read-only transaction.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=5&mode=live&start=224.70300000000003)

[Transactions](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live)

[In this video, we'll take some time to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=1.077) [understand the different types of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=2.723) [transactions supported by Cloud Spanner.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=4.266) [Recall that earlier in the course, we had](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=7.83) [discussed how there are transactional and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=9.770000000000001) [non-transactional ways to work with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=11.8212) [Spanner. Transactions might be read-write](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=14.420666666666666) [or read-only, and non transactional single](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=16.99866666666667) [reads are possible as well. So let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=20.19866666666666) [become a little more rigorous. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=23.72057142857143) [define a Cloud Spanner transaction. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=25.592333333333332) [general database theory, a transaction is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=28.6155) [defined as an all or nothing set of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=30.594374999999996) [operations. And a Cloud Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=33.49475) [transaction is not all that different. It](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=35.193999999999996) [is a set of reads and writes that are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=37.240333333333325) [executed atomically at a single logical](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=40.51199999999999) [point in time. This is equivalent to the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=43.5872) [serializability of transactions in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=47.37299999999999" \t "psplayer) [traditional computer science. It turns out](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=49.463499999999996) [that there are three types of transactions](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=51.83833333333333) [in Cloud Spanner. There are locking](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=53.75625) [read-writes, which have pessimistic](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=56.61)[locking and which might abort. There are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=57.877) [read-only transactions, which do not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=60.864799999999995) [commit and hence do not acquire locks. And](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=63.00785714285715) [finally, there are partitioned DML](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=66.43516666666667) [transactions, which are used for bulk](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=67.881) [operations by the system. Let's quickly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=70.107) [cycle through their use cases. You would](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=73.22357142857143) [use locking read-write transactions for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=75.83479999999999) [writes which depend on the values of reads](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=77.53542857142858) [or if you have multiple rights which need](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=80.21799999999999) [to be atomically executed. You would also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=83.55757142857144) [use locking read-write transactions for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=86.2905) [conditional writes. Moving on, read-only](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=88.564) [transactions do not commit, and therefore](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=91.457) [they cannot abort. You'd use these if you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=94.42749999999998) [want to perform more than one read at the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=97.04499999999999) [same timestamp, effectively, if you have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=99.90285714285714) [multiple reads which require consistency.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=102.3) [The third type of transaction is a little](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=105.85) [different. Partitioned DML transactions](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=108.28288888888889) [are used for large-scale UPDATE or DELETE](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=109.82050000000001) [statements. These are system created. They](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=113.80679999999998) [do not roll back. This is a way of getting](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=117.0386) [efficient execution of large-scale UPDATEs](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=120.8135714285714) [and DELETEs by partitioning the key space.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=123.17059999999998) [These transactions do not lock the entire](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=127.103) [database, which is good. But they cannot](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=129.236) [be rolled back, which may sometimes be a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=131.88600000000002)[concern. Let's clearly understand the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=134.68316666666672) [differences between traditional DML and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=136.49939999999995) [partitioned DML. Traditional DML is used](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=139.1726666666667) [for regular transaction processing of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=141.60133333333334) [sort that we, as end users, are accustomed](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=143.6058571428572) [to. Partitioned DML is for databases-wide](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=147.0615) [operations. Regular DML includes user](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=150.76283333333336)[transactions, which affect a small subset](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=153.49079999999998) [of a database. Partitioned DML is ideal](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=155.65387499999997) [for bulk updates, deletes, filling in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=158.29899999999998) [default values, and such large-scale](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=161.11479999999997) [operations. Traditional DML operations are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=164.41424999999998) [usually not idempotent, which means that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=167.1796666666667) [you cannot safely execute them repeatedly.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=169.96833333333336) [In contrast, partitioned DML operations](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=174.261) [must be idempotent. The system should have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=176.288) [the freedom to run a partitioned DML](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=179.412) [statement repeatedly without altering the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=181.975) [state of the database relative to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=184.482) [executing it just once. Regular DML](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=186.58714285714282) [transactions can span multiple statements.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=189.54585714285716) [Partitioned DML is single statement only.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=192.423) [Regular DML supports any form, any type of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=196.079) [statement, however complex. Partitioned](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=199.661) [DML statements must satisfy a specific](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=202.31716666666665) [condition. A partitioned DML transaction](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=205.66920000000002) [can only include one statement, and that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=208.72083333333333) [statement needs to be fully partitionable,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=212.12800000000001) [which means that it should be possible to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=214.447) [express that one statement as a union of a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=216.231) [set of statements that each such statement](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=219.672) [only accesses a single row of a single](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=222.809) [table, so no self-joins, no multiple table](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=226.094) [statements. If you think about simple](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=230.04637500000004) [column-wide update or delete statements,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=232.31933333333333) [these are classic examples of fully](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=234.64) [partitionable statements. And finally,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=237.124" \t "psplayer) [regular transactions are explicitly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=239.6798) [created and submitted by users.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=241.70833333333334) [Partitioned DML transactions, on the other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=244.585) [hand, are system created. Spanner will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=246.407) [accept a command from a user, decide that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=248.98725) [this calls for a partitioned DML transaction, and go ahead and execute it.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=6&mode=live&start=251.6222857142857)

[Read-write Transactions](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live)

[We've executed read-only transactions.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=1.14) [Let's now go ahead and implement a read-](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=3.735) [write transaction. In this example, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=5.659) [will perform a write, which is contingent](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=7.8954) [on the value of a previous read. We are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=9.423250000000001) [going to transfer money from the wallet of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=12.103571428571426) [one customer to another. The first time](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=15.549888888888887)[around, the transfer is successful. The](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=18.28725) [second time around, there isn't enough](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=20.127285714285716) [money in the wallet, and the transaction](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=21.905) [has to abort. The source for this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=23.53) [transaction is going to be the wallet for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=26.252) [AA-10480, which has an opening balance of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=28.873) [$ 1700.40, and the destination is going to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=33.708) [be the wallet for CG-12520, which has an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=37.118) [opening balance of only $50. Let's switch](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=41.727) [over to Datalab where we have coded this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=45.2855) [up. We have an outer method, which is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=47.256) [called transfer\_wallet\_amounnt, and then](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=50.698499999999996) [we have a nested inner method called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=52.72175) [update\_wallet. This helper method takes in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=55.1085" \t "psplayer) [a transaction object, which we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=57.466714285714296) [instantiate below. Let's create a keyset](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=59.80899999999999) [with a specific key for the source wallet](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=61.9445) [and another keyset with the specific key](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=64.63928571428572) [for the destination wallet. Now we had](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=67.282) [read the contents of the source wallet up](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=69.61400000000002) [above, and we used that for our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=71.86866666666668) [conditional write. We are only going to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=74.426) [transfer the amount if there is enough](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=76.579) [money in the source wallet. So if Andrew](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=78.454) [Allen has enough money in his wallet, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=81.09433333333334) [will reduce his balance and increase](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=83.35385714285715) [Claire's balance. And if not, we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=86.208) [throw an exception signaling that Andrew](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=89.44637499999999) [Allen does not have enough funds for this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=91.36385714285713) [transfer to go through. And finally, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=94.20550000000001) [are able to actually execute the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=96.63914285714284) [transaction by invoking the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=98.48666666666668) [transaction.update method. Notice how we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=100.152" \t "psplayer) [have to specify the table, the columns,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=103.540625) [and the values. Now all of this code is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=105.67900000000002) [happening inside the inner helper function](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=108.79525000000001) [called update\_wallet, which took in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=111.06100000000002)[transaction as an argument. And you might](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=113.446) [be wondering where the transactions is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=116.20985714285713) [instantiated. The answer is it's not. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=118.48833333333334) [method, the update\_wallet method is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=121.43883333333332) [actually a callback function, which we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=123.298) [pass into the database.run\_in\_transaction](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=125.34314285714288) [method. So it's actually Spanner which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=128.67725)[instantiates the transaction and passes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=131.74166666666665) [that transactions into this update\_wallet](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=133.62860000000003) [method as an argument. So the code for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=135.87060000000002) [this read- write transaction was](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=138.5751111111112) [significantly more subtle than that for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=140.41819999999998) [the read-only transactions we had](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=142.433) [encountered so far. We are done. We are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=144.44750000000002) [now ready to give this method a spin.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=146.81799999999996) [Let's try and transfer $500, and this goes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=148.5664285714286) [through successfully. We can verify that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=152.32166666666672) [these changes are reflected in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=154.6572857142857)[database by shifting back to Spanner where](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=156.63385714285712) [we see that Andrew's wallet balance has](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=159.16814285714287) [reduced by $500, and Claire's has gone up](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=161.707) [by the same amount. But if we now try to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=164.916) [transfer another $1700, this will not fly.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=168.00074999999998) [We get a value error because Andrew Allen](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=171.843) [does not have enough funds to transfer.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=174.068) [And the crucial bit is that the integrity](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=176.677) [of the system is still maintained.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=178.95) [Andrew's balance has not reduced. If we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=180.995) [try and do a smaller transfer of $250,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=184.52511111111113) [this time it will go through successfully,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=186.53257142857143) [and the changes will also be reflected in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=189.4397142857143) [Cloud Spanner. And in this way, we have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=192.7995)[successfully implemented a read-write](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=195.0475714285714) [transaction in which the write was contingent on values which were read in.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=7&mode=live&start=196.70940000000002)

[Secondary Indexes](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live)

[In Cloud Spanner, the choice of primary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=1.086) [key also dictates the physical layout of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=3.0363749999999996) [our data. If we now want to use secondary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=5.891250000000001) [indexes, which are indexes on another](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=8.762499999999998) [non-key column, this is a special](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=11.15916666666667) [procedure. Let's see how this is done. It](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=13.776833333333334) [turns out that creating a secondary index](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=16.675857142857144) [is fairly simple. Simply select your table](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=18.778000000000002) [and hit the Create Index button. We are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=21.977500000000006) [prompted for an index name and then for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=25.0765) [some columns, which are going to be used](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=28.484333333333332) [in the index construction. In this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=31.224000000000007) [example, we create a secondary index on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=33.13771428571429) [the FirstName column, and we are fine to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=35.522749999999995) [go with the default Sort ascending option.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=38.56055555555555) [There are various additional index](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=41.94) [options, which we could explore. But those](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=43.92083333333333) [are pretty advanced, so we will leave all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=46.738249999999994) [of these options unchecked. If you'd like](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=48.878666666666675) [to learn more about them, here are some](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=51.090625) [really helpful tooltips. This is in the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=53.61749999999999) [Index option guidance section. In any](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=56.5715) [case, we are now done. We can hit Create,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=58.82471428571428) [and our secondary index will come into](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=61.4485) [existence. Notice the name of this index](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=64.17375) [is spikey\_firstname\_index. Pay close](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=66.14885714285717) [attention to this because we're going to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=68.90514285714286) [need to use this in our queries. Note that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=70.61077777777778) [we can also create secondary indices from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=73.51614285714285) [the command line using the ddl update](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=75.66875) [command. Here we create another secondary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=78.60216666666666) [index called spikey\_lastname\_index. And we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=81.33966666666666)[can also create a secondary index from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=84.7755) [within Python by using the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=86.59216666666667) [update\_ddl\_method on our database object.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=88.408" \t "psplayer) [Now creating a secondary index is simple](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=91.794) [enough. We are able to do so in three](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=94.13987500000003) [different ways. But the noteworthy bit is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=96.35419999999996) [in actually using the secondary index. By](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=98.42899999999999) [default, Cloud Spanner will not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=101.31466666666667) [automatically choose to use secondary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=102.843) [indices. So we have to direct Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=105.49883333333332) [Spanner. We have to force it to use the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=107.93285714285713) [index that we want. And that's why within](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=109.95479999999998) [our SQL query, we need to have this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=112.61525000000003) [highlighted syntax, the FORCE\_INDEX clause](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=115.19771428571433) [followed by the name of the secondary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=117.41066666666666) [index we created. This FORCE\_INDEX clause](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=120.55587499999997) [needs to be included explicitly in the SQL](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=122.76849999999999) [if you're using the snapshot.execute\_sql](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=125.43028571428573)[method. Alternatively, we could choose to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=128.49925000000002) [use the snapshot.read method and simply](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=131.08771428571424) [specify the index as one of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=133.7353333333333) [parameters. Let's round out this demo with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=137.25650000000007) [a look at a STORING clause, which you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=139.00999999999996) [might want to use when your most common](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=141.08600000000004) [query uses a combination of key and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=144.11114285714285) [non-key attributes. For instance here, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=148.06733333333332) [are using a STORING clause along with a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=150.55950000000004) [CREATE INDEX statement. The index is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=153.6097142857143) [actually on the Product\_bought column of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=156.15285714285716) [the spikey\_product\_details table. But in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=158.96759999999998) [addition to this, we are also asking the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=161.42088888888887) [index to store the values of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=163.496625) [Price\_Paid column. Why would we want to do](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=165.461" \t "psplayer) [this? Well the Price\_Paid column is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=168.93122222222223) [clearly not unique. It's not the kind of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=171.35687499999995) [column we can include in an index. But it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=173.54755555555553) [is going to be included in our most common](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=175.83900000000003) [queries. And that's why we want the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=179.3266666666667) [physical construction of this index to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=181.1435714285715) [store the values of the Price\_Paid along](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=182.78785714285718) [with the Product\_bought. So we go ahead](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=185.0814285714286) [and construct this index, and then we are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=187.8728333333333) [able to use it for queries like the one](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=190.29849999999993) [you see on screen now. Because this is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=192.51140000000007) [query which retrieves the Product\_bought,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=195.6136249999999) [along with the Price\_Paid, the efficiency](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=197.868) [of this query increases significantly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=200.17666666666668)[because of our storing these two values together.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=8&mode=live&start=201.95633333333333)

[Commit Timestamps](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live)

[Let's round off this module with a demo](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=0.738) [which shows how we can work with commit](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=2.916) [timestamps. A commit timestamp is a pretty](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=5.60311111111111) [specific construct in Cloud Spanner. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=8.531857142857142) [is a way to determine the exact time when](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=11.20711111111111) [a transaction was committed to the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=13.942625) [database. We can use commit timestamps to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=15.998375) [record exactly when a change occurred, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=17.91728571428571) [this is implemented using TrueTime](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=21.336857142857145) [technology. Using a commit timestamp is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=23.991142857142865) [two-step process. We first need to define](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=26.447499999999998) [a timestamp column and set the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=29.083250000000003) [allow\_commit\_timestamp flag on it. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=31.65757142857143" \t "psplayer) [will create a column. We then go ahead and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=33.9932) [write the timestamp as a part of our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=36.67555555555556) [transaction into this column. Let's turn](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=39.30449999999999) [to Python and see how this is implemented.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=41.4984) [Here we are altering our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=43.936) [spikey\_product\_details table to explicitly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=45.522" \t "psplayer) [add a column. That column is called the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=48.085) [LastUpdateTime, and it's of type](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=50.549" \t "psplayer) [TIMESTAMP. And now here is the important](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=54.08899999999999) [bit. We need to add an OPTIONS clause in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=56.15985714285715) [which we explicitly set the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=58.513222222222225) [allow\_commit\_timestamp flag to be true.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=60.199" \t "psplayer) [Let's go ahead and invoke this method. A](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=63.483) [column will be added to our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=65.77471428571428) [spikey\_product\_details table. This is of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=66.919" \t "psplayer) [type TIMESTAMP, and it's initially](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=69.81479999999998) [populated with only null values. Now we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=71.75225) [actually need to instruct Spanner to write](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=74.40124999999999) [values into this column. For this we have](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=76.3314) [a method called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=78.77814285714285)[update\_data\_with\_timestamp. The only](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=79.37) [noteworthy part of this query is that we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=82.0815) [specify values for the LastUpdateTime](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=84.14033333333333) [column, and while doing so, we simply make](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=85.62616666666668) [use of the spanner.COMMIT\_TIMESTAMP field.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=88.91099999999999) [Once the batch update is successful, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=92.238) [can switch back to Spanner and verify that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=94.592125) [values have indeed been written into the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=96.81328571428571) [LastUpdate Time column. This column can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=99.651" \t "psplayer) [now be queried like any other column in a Spanner data table.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=9&mode=live&start=102.46275000000001)

[Summary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live)

[This gets us to the end of a module in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=0.564) [which we covered a fair amount of ground.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=2.642) [Let's quickly summarize. We learned how to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=4.843) [construct interleaved tables to more than](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=7.6546666666666665) [two levels of nesting and implement](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=9.527500000000003) [cascading delete on them. We spent a lot](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=11.657000000000002) [of time understanding how to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=14.121222222222224)[programmatically access Cloud Spanner from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=15.179) [Datalab. We implemented read-only and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=18.149000000000004" \t "psplayer) [read-write transactions. Read-write](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=20.767) [transactions, in particular, had a subtle](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=22.192999999999998) [syntax, which involved the use of a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=24.415625000000002) [callback method. We saw how we can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=27.101499999999998) [construct a secondary index and force](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=29.509874999999994) [Cloud Spanner to use it. We also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=31.534125000000003) [demonstrated the use of the STORING clause](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=34.076499999999996) [for non-key attributes, which are commonly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=36.110749999999996) [queried, along with indexed attributes.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=38.78225) [And we rounded out the module by](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=41.977) [understanding what a commit timestamp is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=43.752) [and how it can actually be implemented in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=46.276) [Spanner in order to record the exact](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=48.511) [instance when a change was made to the database.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=45a3f496-ea30-4604-b270-ebe4b2cfc50c&clip=10&mode=live&start=50.767)

[Integrating Cloud Spanner with Other Google Cloud Services](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live)

[Module Overview](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live)

[Hello, and welcome to this, the final](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=0) [module of this course. This module is all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=3.383333333333333) [about interacting with Cloud Spanner from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=6.374571428571428) [other GCP services. In particular, we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=9.107) [spend a lot of time exploring the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=11.676222222222222) [relationship between Spanner and Dataflow.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=13.7044) [We shall see how Dataflow is used as a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=15.77775) [connector between Spanner and Cloud Store](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=19.372285714285713) [to afford a seamless migration path into](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=22.00971428571429) [Spanner. We will also see how Spanner can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=24.982) [be queried from Cloud Functions and how](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=27.821285714285715) [Stackdriver monitoring can be used to keep tabs on your Cloud Spanner resources.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=0&mode=live&start=30.53042857142857" \t "psplayer)

[Export Databases to Cloud Storage Using a Dataflow Template](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live)

[In this video, we will explore the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=0.937) [seamless interconnection between Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=3.234750000000001) [Spanner, Dataflow, and Cloud Storage.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=5.15) [Remember that Cloud Spanner was only made](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=8.03) [available for use outside Google, that is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=9.845) [on the Google Cloud Platform, in quarter 1](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=12.583285714285713) [of 2017. For most of 2017, persistent](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=16.0804) [reports were of problems getting data into](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=19.795857142857145) [Cloud Spanner. Google took note of this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=23.363714285714277) [migration issues and worked in seamless](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=26.054142857142853) [integration with Cloud Storage using](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=28.46433333333333) [Dataflow. So in this video, we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=31.190499999999997) [explore exporting data from Spanner to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=33.670750000000005) [Cloud Storage. And then in the next one,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=36.110666666666674) [we will reverse this direction. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=38.502) [start by creating a bucket. We are going](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=41.1505) [to make use of gsutil. If you have not](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=43.60750000000001) [used gsutil or you're not familiar with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=45.92988888888888) [Google Cloud Storage, I'd suggest that you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=47.903200000000005) [go back and check out some of our other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=49.865555555555545) [Pluralsight courses on Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=51.967999999999996" \t "psplayer) [Storage. Here I am using gsutil followed](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=54.36000000000001) [by mb to create a bucket on Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=57.59466666666665) [Storage. If you are running this command](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=60.57000000000001) [from Cloud Shell, this is going to work](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=62.1115) [just fine. If you're running this from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=64.77874999999999) [your local machine, you might need to run](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=66.50400000000003) [one command before this. That is gsutil](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=68.69849999999997) [config. In any case, let's go ahead and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=72.99833333333332" \t "psplayer)[run this command. And we see that a bucket](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=75.64200000000004) [is created for us. We can switch to the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=78.39540000000002) [web console, navigate to storage, to the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=81.14128571428574) [storage browser in fact, and there we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=83.57728571428574) [find spikeysales\_data\_backup. That's the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=86.1327142857143) [bucket we just created. Okay, now let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=89.15866666666668) [turn back to Spanner. Let's go back to our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=91.75899999999999)[familiar Spikeysales Instance. Here we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=95.34287500000002) [will select our spikey-test- database and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=97.409) [click on the Export icon on the top-right.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=99.561) [This leads us to a page where were can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=102.14275) [specify the export location. We click on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=105.33142857142857) [the Browser button. This will allow us to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=107.72250000000001) [browser through all of our Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=109.79574999999998) [Storage buckets. We select](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=111.80233333333332) [spikeysales\_data\_backup and move on. So](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=113.73166666666665" \t "psplayer) [we've now defined the data sync. We next](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=116.56928571428571) [need to choose the database. This is the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=119.27557142857144)[spikey-test-database. This is going to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=122.6935) [have the data which we seek to export.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=123.86188888888887) [Notice how so far we have not had any](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=125.81199999999998) [indication at all that what's going on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=128.78912499999998) [under the hood is a Dataflow job. Well](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=131.02544444444447) [that's about to change. Click on the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=134.19740000000002) [Pricing info tab, and this gives us a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=136.512) [whole bunch of fine print, which makes it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=138.51988888888886) [clear that it's actually a Cloud Dataflow](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=140.84757142857146) [template, which is going to be executed.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=143.36520000000004) [And this explains why need to select the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=145.655) [region. Now the recommended region is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=148.51722222222227) [us-central1. So let's just go with that.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=151.42750000000004) [That's where Dataflow resources are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=153.52) [concentrated. This is so unusual that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=155.91333333333336)[Google feels compelled to make us](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=158.33485714285712) [explicitly click that checkbox to confirm](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=160.99885714285713) [that we've understood the charges. While](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=163.52599999999998) [discussing pricing, we had mentioned that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=166.0432) [import and export are free, but Dataflow](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=168.21450000000002) [is not. And here, we do need to pay the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=170.89619999999996) [charges incurred by Dataflow. So if you're](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=173.67433333333327) [fine with that, we go ahead and hit](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=176.11666666666665) [Export. This triggers a Dataflow job, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=178.05085714285713) [we can view those job details right here](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=180.8845) [by clicking on that button which takes us](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=183.185) [to Cloud Dataflow. We won't go into the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=185.61339999999998) [nitty-gritty of Dataflow, but you should](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=187.9911428571428) [be aware that this is a serverless compute](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=189.50549999999996) [technology, which allows both batch and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=192.64219999999995) [streaming pipelines to be executed in a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=194.90299999999996) [serverless manner. Autoscaling is taken](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=197.91599999999994" \t "psplayer) [care of completely by Dataflow. Here we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=200.22937499999998) [see one minor warning. This warning has to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=203.40666666666667) [do with the name of the job. There are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=205.85654545454543) [still some rough edges in the templates in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=207.89950000000002) [the integration between Dataflow and Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=210.42200000000003) [Spanner. That's fine. This is not a detail](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=213.33124999999998) [that we need to worry about. We can see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=215.32944444444442) [that autoscaling has happened. The job has](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=218.4481428571429) [run successfully. So at this point, we can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=221.00619999999998) [switch back to Spanner, and we get](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=223.03966666666665) [confirmation that the export was](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=225.0774285714286) [successful. Let's go to Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=227.22366666666665) [Storage to the browser, and there we can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=229.129875) [see in our spikeysales\_data\_backup bucket](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=231.6115) [that the database contents have indeed](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=233.8345) [been exported. If we explore that, we see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=237.09133333333338) [that there is one JSON file for the export](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=239.3586666666666) [as a whole, a manifest file for each](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=242.2326666666666) [table, and then the actual data from each](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=245.4285) [table in that database. Let's explore the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=247.64044444444448) [contents of some of these files. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=250.79816666666662) [switch back to Cloud Shell and run a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=252.5727777777778) [gsutil cat command. Let's check all the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=254.771" \t "psplayer) [contents of the spanner- export.json. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=257.827) [merely contains the names of each of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=261.147875) [tables and the corresponding manifest](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=263.2554285714286) [files. We can also monitor the status of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=265.8175714285715) [this and all previous such Dataflow jobs](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=268.28066666666655) [within Spanner. By navigating into the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=271.53299999999996) [correct part of the Spanner dashboard, we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=273.8504999999999) [can see that our export job was indeed successful.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=1&mode=live&start=276.17642857142863)

[Import Databases to Cloud Storage Using a Dataflow Template](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live)

[Let's now execute yet another demo, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=0.843) [demonstrates integration between Dataflow](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=3.48775) [Cloud Storage and Cloud Spanner. Here we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=5.435) [are going to make use of the import](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=8.2462) [functionality to get data into our Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=9.991) [Spanner instance. This is very important](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=12.337) [functionality as far as Spanner is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=16.007)[concerned. For the first year or so of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=18.806428571428565) [Spanner's existence, many users had](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=21.117500000000003) [concerns about migration parts into](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=23.040333333333336) [Spanner. Now because of this great](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=26.423)[integration feature using Dataflow,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=29.20316666666667) [Spanner has become a realistic option no](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=30.839000000000002) [matter what database technology you are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=33.715857142857146) [migrating from. You simply stage your data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=36.343) [into Google Cloud Storage and then stage](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=38.67457142857143) [it into Spanner. So let's pick up right](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=41.604499999999994) [from where we left off. We had the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=44.31949999999999) [Spikeysales Instance. Now let's click on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=46.855399999999996" \t "psplayer) [the Import button right up top. This leads](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=48.78999999999999) [us to a dialog where we specify a source](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=51.355399999999996) [folder. Once again, we can browse, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=55.009249999999994) [let's navigate to the bucket which we just](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=57.370875) [wrote a moment ago. This is the result of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=59.721199999999996) [the export from the previous database.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=62.92977777777776) [That was the source of the data. We need](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=65.09799999999998) [to specify a sync. That's the destination](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=68.73300000000002) [database. Let's call it](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=70.86749999999999) [spikeysales\_imported\_database. As before,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=71.718" \t "psplayer) [we need to specify a region. This is for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=75.53450000000001) [the Cloud Storage location. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=78.25614285714286) [us-central1. Let's go ahead and check out](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=80.91099999999999) [the pricing info, which again tells us](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=83.07450000000001) [that this is running Dataflow under the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=85.07362499999998) [hood. Notice so far that there is nothing](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=87.7984) [in this dialog to tell us that we are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=90.04122222222223) [actually using Dataflow. Let's confirm](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=92.02737499999995)[those charges, those are related to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=94.13479999999998) [Dataflow, and then hit Import. Once again,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=97.07566666666669) [we'll now see the job has been kicked off.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=99.69) [We can view the job details by switching](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=102.259) [to Cloud Dataflow. There is the import](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=103.8261111111111) [Transform pipeline. It's running. We can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=106.711) [also examine autoscaling. There is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=110.17642857142854) [warning there. This warning has to do with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=112.43260000000001) [some internal communication within Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=114.34174999999998) [and Dataflow, and we don't really need to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=117.12499999999999) [worry about it. The job completes as we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=120.08433333333333) [can see from the green checkmark and also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=121.85611111111109) [from the autoscaling graph on the right,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=124.2996666666667) [which shows that no nodes are currently in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=126.927)[use. We can close this and go back to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=129.58477777777776) [Cloud Spanner. We see that the import job](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=132.72179999999992) [was successful. This whole process took 8](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=135.10674999999992) [minutes and 47 seconds. We also see that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=137.6874444444445) [our spikeysales\_imported\_database has](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=140.02779999999996) [appeared. This is in our Spikeysales](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=142.31833333333333) [Instance. All of the tables from the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=145.31716666666668) [original spikey- test-database have been](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=147.68075000000002) [successfully recreated. Let's query the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=151.33180000000002) [data to make sure that everything is in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=154.00574999999998) [order. We hit the Query button up top and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=156.3955) [type out a simple query to pull in all of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=158.9182) [the spikey\_product\_details. And we can see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=161.58533333333324) [that we do indeed get all of the data as](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=164.78172727272727) [we were expecting it. We have successfully](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=167.46400000000003) [exported data from Cloud Spanner into](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=170.4665) [Cloud Storage and then reimported that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=173.0427142857143) [data back into Spanner and queried it. The cycle is complete.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=2&mode=live&start=175.42214285714286)

[Using Cloud Spanner from within Cloud Functions](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live)

[Let's change tracks a little bit and see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=1.246) [how Cloud Spanner can be queried from](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=3.2) [within Cloud Functions. We are not going](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=5.215) [to go into Cloud Functions in a whole lot](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=7.411555555555555) [of detail, but they are a serverless](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=9.220400000000001) [compute solution. They are the equivalent](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=11.569333333333335) [of AWS Lambda. Let's start by switching to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=14.765142857142859)[Cloud Shell. Most of our work here is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=17.968857142857143) [going to be done from within the command](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=19.820600000000002) [line. We create a directory called](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=21.958600000000004) [spanner\_cloudfunction and cd into it. Then](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=23.628" \t "psplayer) [we do something interesting. We open up](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=27.109) [the code editor by clicking on the little](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=29.094000000000005) [pencil icon on the top-right. In case you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=31.45742857142857) [have not come across code editor before,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=34.327125) [this allows a nice UI on top where we can](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=36.10755555555556) [navigate the filesystem and a command line](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=39.62862499999999) [down below. Let's hit Refresh just to make](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=42.260999999999996) [sure that everything is up to date, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=44.501499999999986) [then we can go ahead and get started.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=46.67366666666665) [Let's enter the spanner\_cloudfunction's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=49.22)[directory and create a new file there.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=51.037) [This file is going to be the index.js](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=53.614) [file. We're going to go ahead and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=56.549999999999976) [implement our cloudfunction code in this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=58.598500000000016)[file. We start by defining a bunch of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=61.302200000000006) [variables. So we reference the Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=64.48225000000001) [library. We go ahead and instantiate the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=67.05666666666669) [Spanner object and specify the instanceId](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=69.00457142857145) [and the databaseId. Note that this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=72.12412499999996) [instanceId is the name of our Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=74.66250000000002" \t "psplayer) [instance, and the databaseId is just](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=76.73814285714286) [spikey-test-database. Now let's code up](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=79.781) [our actual Cloud Function. This takes in a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=82.59800000000001) [request and returns a response. We start](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=85.7367777777778) [by referencing some of the global](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=88.281) [variables we had created up above, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=89.982) [then we also have our simple query, which](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=92.54424999999999) [is simply SELECT \* FROM](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=94.86116666666666) [spikey\_product\_details. And our return](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=96.847" \t "psplayer) [value is simply the results of running](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=99.98687500000001) [this query on the database object. Well,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=102.4095) [there is just a little bit of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=105.22175) [preprocessing that we'll do before that.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=106.648) [First, we convert each of the rows to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=108.69) [JSON, and then we go ahead and nicely](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=111.09088888888886) [format them with some descriptive](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=113.4591111111111) [information. Because this is an HTTP](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=115.67075)[response, we also set the status to be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=118.06683333333334) [200. This is indicative of success. Let's](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=120.5835) [throw in an exception-handling block. Here](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=123.77283333333332) [we return 500 and indicate a server error,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=126.03450000000001) [and we are good to go. We've coded up our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=129.129) [Cloud Function. This is in the index.js](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=132.031) [file. Let's also go ahead and add another](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=134.6743333333333)[file. This is the package.json. This is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=137.528125) [metadata, which is required while we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=140.30285714285714) [deploy our Cloud Function. So note here,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=142.2714) [we need to specify the name, version,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=144.93133333333336) [licenses which are used, etc. Notice, for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=147.2875) [instance, how we are telling Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=150.4635714285714) [Functions that any version of Node.js is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=152.2727142857143) [fine provided it's greater than or equal](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=155.3305) [to 4.3 .2. In addition, there's also some](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=157.301) [information about the scripts and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=160.591) [dependencies. The dependency here is on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=163.78016666666667) [Cloud Spanner. There is some additional](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=166.29442857142863) [boilerplate code, which we are not going](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=168.51366666666664) [to go into great details in. All of this](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=170.12911111111117) [will be explained in a lot more detail in](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=172.71024999999997) [our course on Cloud Functions here, on](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=175.29040000000003) [Pluralsight. Once we are done, we exit out](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=178.10575" \t "psplayer) [of the code editor by clicking that same](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=180.18470000000005) [pencil icon over in the top-right. And we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=182.66914285714284) [are now ready to deploy our Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=185.87500000000003) [Function. We do so by invoking gcloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=188.0765000000001) [functions deploy. The name of our Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=191.36625000000006)[Function is spikey\_spanner\_function, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=193.68442857142855) [it's going to be triggered by HTTP. In](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=195.28779999999998) [other words, this is a webhook. When we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=199.39685714285713) [run this command, the HTTP picks up the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=202.1188888888889) [index.js file and the package.json and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=204.4052857142857) [successfully publishes it. The most](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=207.311) [interesting part of this response is the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=209.6567142857143) [httpsTrigger URL. We can see that there.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=212.19" \t "psplayer) [It's the URL that we can hit in our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=214.507) [browser in order to invoke our Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=217.59850000000006) [Function. Let's switch back to the web](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=220.62400000000002)[console. From the navigation menu, we will](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=222.8667142857142) [find the Cloud Functions section, and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=224.85725000000008) [there we will find that this Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=226.96328571428575) [Function is indeed available. It has been](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=229.7735) [successfully published. The name is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=232.59700000000004) [spikey\_spanner\_function. Let's try out](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=235.52799999999996" \t "psplayer) [this Cloud Function using curl. For this,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=237.24212500000004) [we'll switch back to Cloud Shell, type](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=239.34199999999998) [curl, followed by the HTTPS URL. And](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=241.22942857142857) [indeed, we are successful. All of the rows](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=245.029) [in our spikey\_product\_details table are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=247.05366666666666) [returned nicely formatted into JSON. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=249.40150000000006) [can also do this from the web console by](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=252.9339) [clicking on the Cloud Function. We can see](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=255.093) [here by the way that there was an](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=257.53229999999996) [invocation in the monitoring graph. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=259.222) [navigate to the Trigger section and click](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=261.7532857142857) [on the invocation URL. And the results of](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=263.94) [our Cloud Function now appear nicely](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=266.8815) [formatted in our browser. Again, the focus](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=269.0056666666667) [of this course is on Spanner rather than](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=272.18350000000004) [on Cloud Functions. But you should be](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=274.6065) [aware that you can explore the code,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=276.4094999999999) [that's the index.js, as well as the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=278.6625) [package.json from right here within the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=281.92999999999995" \t "psplayer) [browser. We have successfully created a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=284.5666666666667) [Cloud Function which queries Cloud Spanner and invoked it using an HTTP trigger.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=3&mode=live&start=286.72150000000005)

[Stackdriver Monitoring of Cloud Spanner Resources](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live)

[In this demo, we will see how Stackdriver](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=1.011) [can be used to monitor Cloud Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=3.259) [resources. Stackdriver is the name of a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=6.020499999999999) [large suite of ops-based services. Offered](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=7.9650000000000025) [Stackdriver monitoring is the one we are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=10.8915" \t "psplayer) [going to use here. So in the navigation](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=13.145000000000001) [pane, we find Stackdriver and then click](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=15.3058) [on Stackdriver, Monitoring. Here we need](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=17.24028571428572) [to first create a workspace. Now a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=19.701874999999998) [workspace is a Stackdriver monitoring](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=22.088) [concept. This is a way of aggregating](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=24.15800000000001) [different projects into one unified](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=26.132857142857137) [integrated view sometimes called a single](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=28.950999999999993) [pane of glass. So let's create a workspace](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=31.58028571428572) [and add all of the projects that we are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=34.085777777777764) [interested in. Here the only one we care](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=36.68928571428571) [about is spikey-spanner. Now Stackdriver](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=39.31633333333335) [also has some AWS inter-compatibility.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=41.438857142857145)[This dates to the time before Google](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=44.166) [acquired Stackdriver. But here, we are](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=46.373) [fine to skip the AWS setup. Next we get](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=49.082) [some helpful tips about installing the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=51.78542857142857) [Stackdriver agent for virtual machine](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=53.564" \t "psplayer) [instances and then prompts about reports.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=55.596) [We are not interested in any reports. All](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=57.93057142857143) [we want to do is to get started with our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=60.504) [monitoring. Let's begin by creating a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=64.21025) [dashboard. This dashboard is called the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=66.8013333333333) [Spanner Database Dashboard. That's quite](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=69.18316666666664) [descriptive. And then let's go ahead and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=71.55760000000001) [add some charts. The first chart has to do](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=73.81766666666664) [with the CPU utilization of our Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=76.06200000000003) [instance. So we've got to locate our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=79.0342) [Spanner resource and then choose CPU](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=81.39274999999998) [utilization as the metric. This](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=83.79149999999998) [combination of a resource and a metric is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=85.934875) [enough to define a chart. So we can move](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=88.62933333333334) [ahead and pick the type of chart that we](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=91.28079999999999) [are interested in. Let's go with a stacked](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=93.544) [area chart instead of the default line](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=95.46937499999999)[bar. Notice that we can also do various](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=97.7788) [other cool things. We can filter to remove](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=99.87212500000003) [noise, we can group by in order to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=102.611) [smoothen, we can aggregate. There is also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=105.763) [a choice of aligner. We are going to go](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=108.832) [with a mean. So this will allow us to view](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=111.05437499999998) [the mean CPU utilization measured over a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=113.37669999999999) [brief interval. We hit Save, and now a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=116.40866666666665) [nice chart appears on screen. Notice that](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=119.81199999999998) [this dashboard can include multiple](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=122.41800000000002) [charts. Let's go ahead and add yet another](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=124.43933333333332) [one. Here we will specify the API request](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=127.15337500000001) [rate. Once again, we have to specify a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=130.44837499999994) [resource, and once again, that resource is](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=133.03337500000004) [our Cloud Spanner instance. This time, the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=134.77600000000004) [metric type is different. It's the API](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=137.7818) [request rate. Let's go ahead and select](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=140.35460000000003) [that. We can see some pretty spiky charts.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=142.46999999999997) [We hit Save, and that's it. We are good to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=145.732) [go. We now have two charts in our](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=149.08179999999996) [dashboard. Stackdriver is tightly](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=151.15366666666668) [integrated with every important GCP](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=152.805) [service, and so we can use this to monitor](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=155.284) [not just CPU utilization or the API](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=157.496) [request, but also the network traffic and](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=160.609) [a host of other metrics. And in this way,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=162.6670000000001) [we have successfully demonstrated the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=165.25542857142855) [integration between Stackdriver monitoring and Cloud Spanner.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=4&mode=live&start=166.94299999999998)

[Summary](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live)

[We have now come to the end of this module](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=0.893) [and the end of this course. So here is a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=2.887) [quick recap of the territory we just](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=5.404777777777777) [covered. We saw how Dataflow templates](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=7.336285714285713) [have been built into Spanner to provide a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=9.466) [seamless migration path for data in. These](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=12.557) [Dataflow templates make it very easy to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=15.979857142857142)[interface Cloud Spanner and Cloud Storage.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=18.446142857142856) [This used to be a concern in the early](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=20.937) [days of Spanner, but now no longer so. We](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=22.9539) [also explored the use of Cloud Functions.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=26.792625) [We saw how easy it is to query Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=29.128) [Spanner from within a Cloud Function.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=31.333) [Lastly, we rounded off the course with a](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=33.428) [look at Stackdriver monitoring of Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=36.203) [Spanner resources. Before we say goodbye,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=37.985) [here is a reminder. It's also a call to](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=42.03150000000001) [action. Do remember to delete all of your](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=45.02550000000001) [Cloud Spanner instances. Otherwise, you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=47.02187499999998) [might be left with a bad case of sticker](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=48.88699999999999) [shock the next time you get your invoice.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=51.869000000000014) [This is particularly true because of the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=54.442) [high node cost associated with Spanner](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=56.293) [instances that are left on. Other](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=58.849) [resources which we used in this class were](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=61.472375) [a VM, which was running Cloud Datalab.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=63.7095) [Remember to delete it. We also used Google](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=66.17) [Cloud Storage buckets. Get rid of those as](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=69.68957142857144) [well. We also used a Cloud Function.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=72.71016666666671) [Please be sure to go ahead and delete all](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=76.222) [of these resources, and don't forget the](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=78.059) [service accounts that we created. And](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=81.103) [finally, here are some related courses for](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=84.11514285714286) [further study. You might want to check out](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=86.41312500000001) [this course on Architecting Big Data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=88.7507142857143) [Solutions Using Cloud BigTable. We've seen](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=90.465) [how Spanner shares many similarities with](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=94.03933333333333) [BigTable. There are some useful tips there](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=96.67133333333334" \t "psplayer) [on good key design, and you might also](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=98.80099999999999) [want to check out a course on BigQuery,](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=101.13525000000003) [which, of course, is the very popular data](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=103.7958571428571) [warehousing solution from the Google Cloud](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=105.959)[Platform. That's it folks. I hope you](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=109.07042857142861) [enjoyed the course. Thank you for watching.](https://app.pluralsight.com/player?course=google-cloud-spanner-creating-administering-instances&author=vitthal-srinivasan&name=5930fe90-fd66-4b32-b4af-4a42d268f94f&clip=5&mode=live&start=110.98366666666664)