



redislabs
HOME OF REDIS

Redis Data Structures and Redis Streams

MAY 2019 | DAVE NIELSEN

Agenda

- Why is Redis so popular?
- Redis Data Structures (Cache, User Sessions, etc)
- New Use Cases - Microservices Framework
- What is a data stream?
- What are the typical challenges you face while managing data streams?
- What is Redis Stream?
- How Redis Stream addresses the challenges?
- How to use Redis Streams?



Who is Redis Labs?



Open source. The leading in-memory database platform, supporting any high performance operational, analytics or hybrid use case redis.io

The home of open source Redis, and commercial provider of **Redis Enterprise** technology, platform, products & services.
redislabs.com/redis-enterprise/

Redis Enterprise Cloud redislabs.com/redis-cloud

- Redis Cloud Essentials
up to 30mb FREE!
- Redis Cloud Pro



Examples



NETFLIX

stackoverflow

reddit

twitch

AMERICAN
EXPRESS

Staples

fiserv.

msn



WORDPRESS

Drupal

Celery

Express

django

Spinnaker

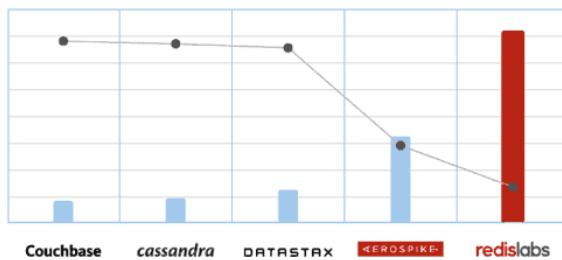
Kong

Redis Top Redis Differentiators

1

Performance

NoSQL Benchmark



2

Simplicity

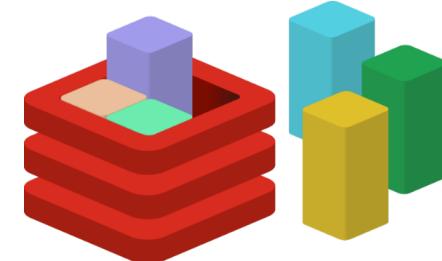
Redis Data Structures



3

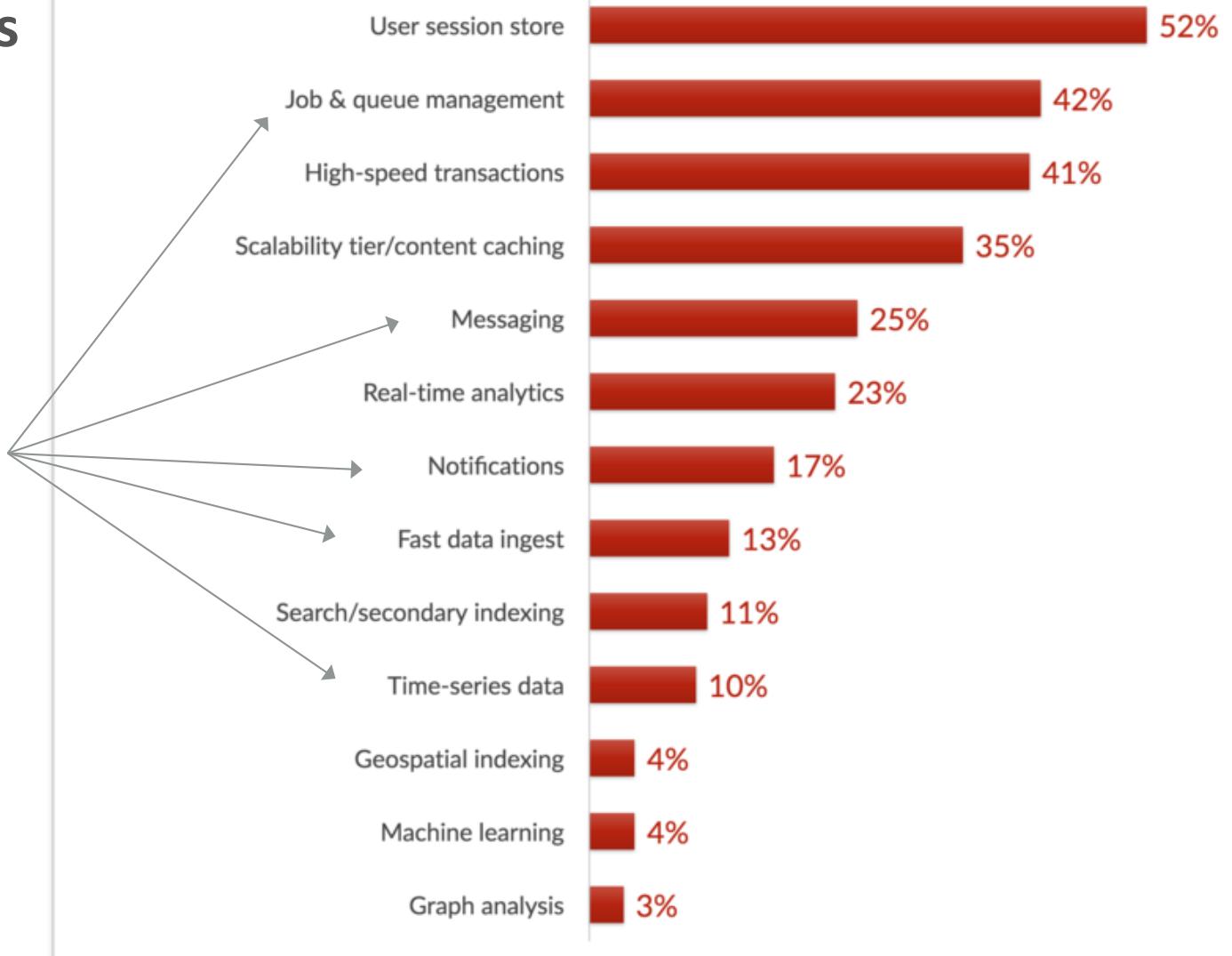
Extensibility

Redis Modules



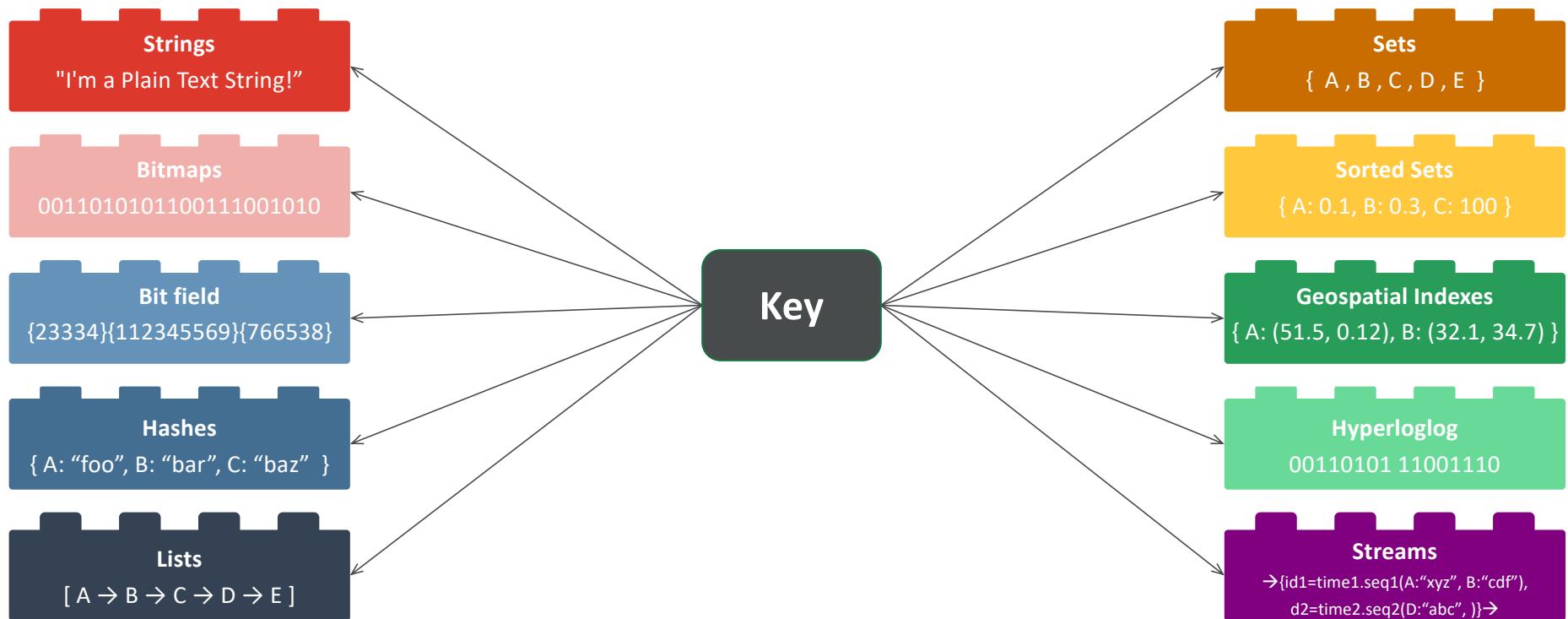
Top Redis Use Cases

Possible Data Stream
Use Cases



2

Simplicity: Data Structures - Redis' Building Blocks



"Retrieve the e-mail address of the user with the highest bid in an auction that started on July 24th at 11:00pm PST"

= **ZREVRANGE 07242015_2300 0 0**

Redis Data Structures

1.  Strings - Cache SQL queries, pages, fast data
2.  Bitmaps - Store 1s/0s (Online/Offline) like Pinterest
3.  Bit Fields - Store arrays of complex numbers
4.  Hashes - Store record-like info (user sessions, favorites, etc.)
5.  Lists - Store ordered data (for ingesting data)
6.  Sets - Store unique/unordered data (tags, unique IPs, etc.)
7.  Sorted Sets - Store real-time sorted data like a MMORG Leaderboard
8.  Geospatial Indexes - Store real-time location (Uber, Lyft, etc.)
9.  Hyperloglog - Store probabilistic data (Google Search count)
10.  Streams - Store and share event data (similar to Kafka)

What is a cache?



Redis cache is very easy ...

- GET mykey
- If mykey = (nil) then
 - run SQL Query
 - SET mykey = “query results” EX 5
- GET mykey
- For more, visit redis.io/commands/set

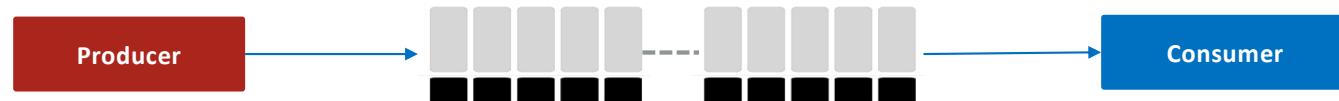
Redis Streams



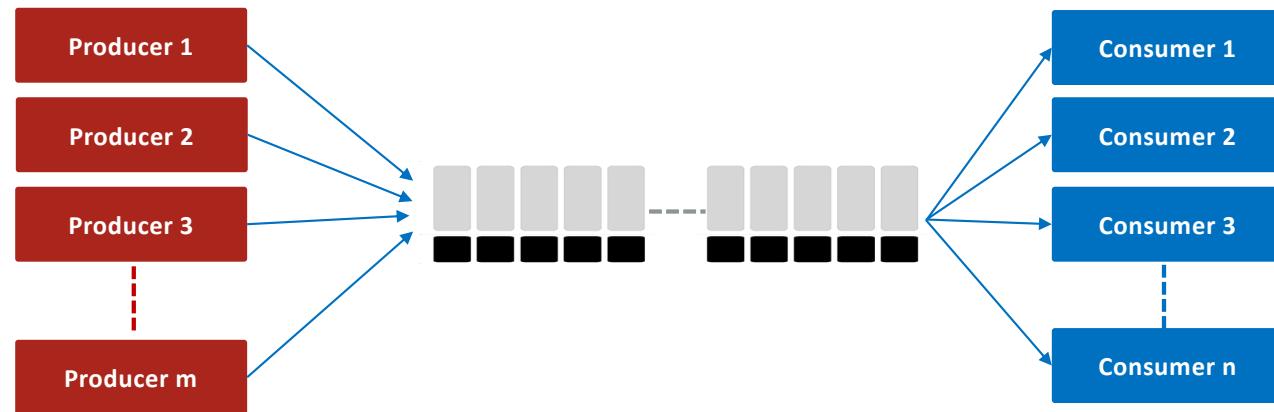
What is a Data Stream?



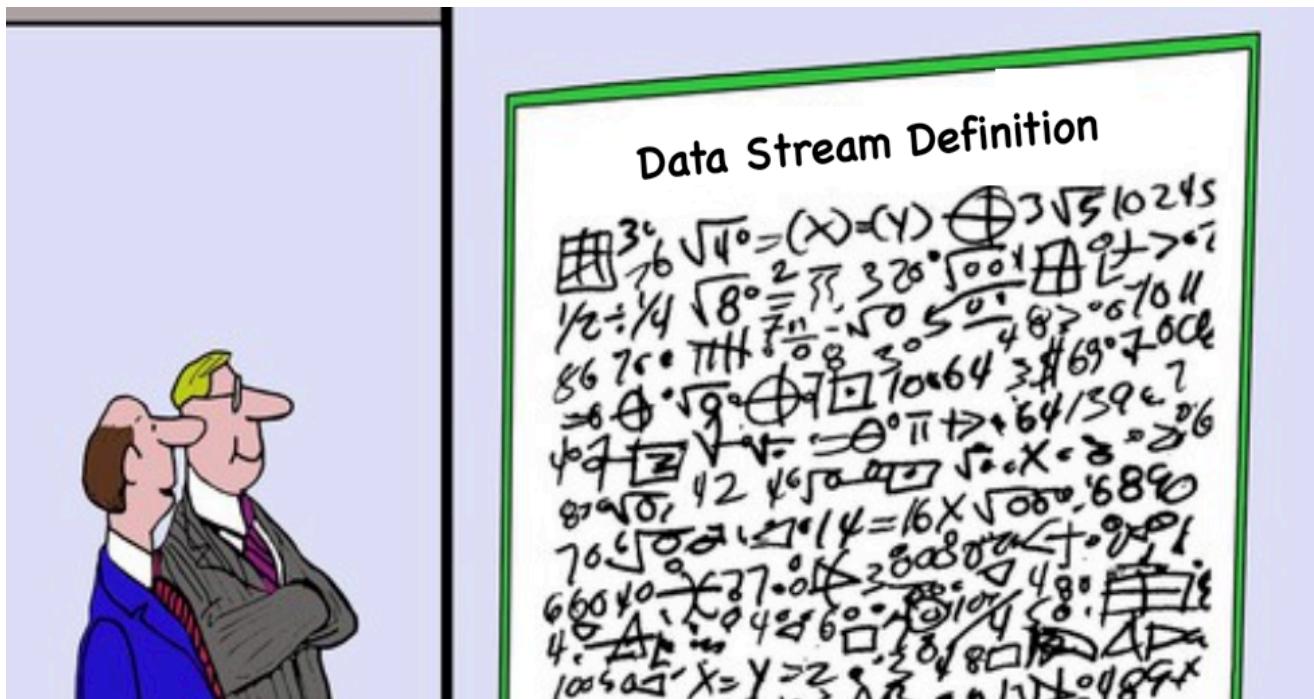
Simplest form of a Data Stream



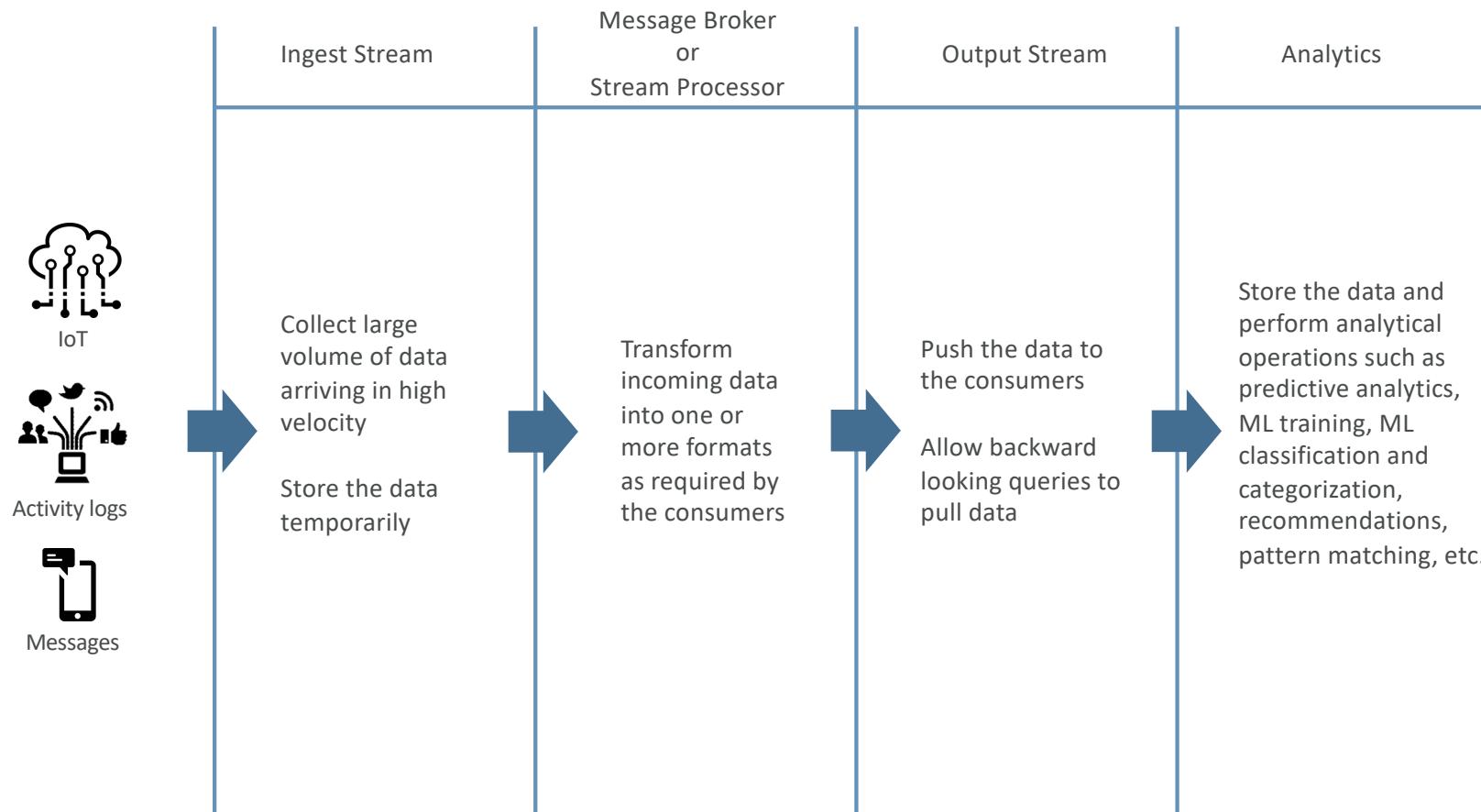
But Often You Have M Producers and N Consumers



It's a bit more complex

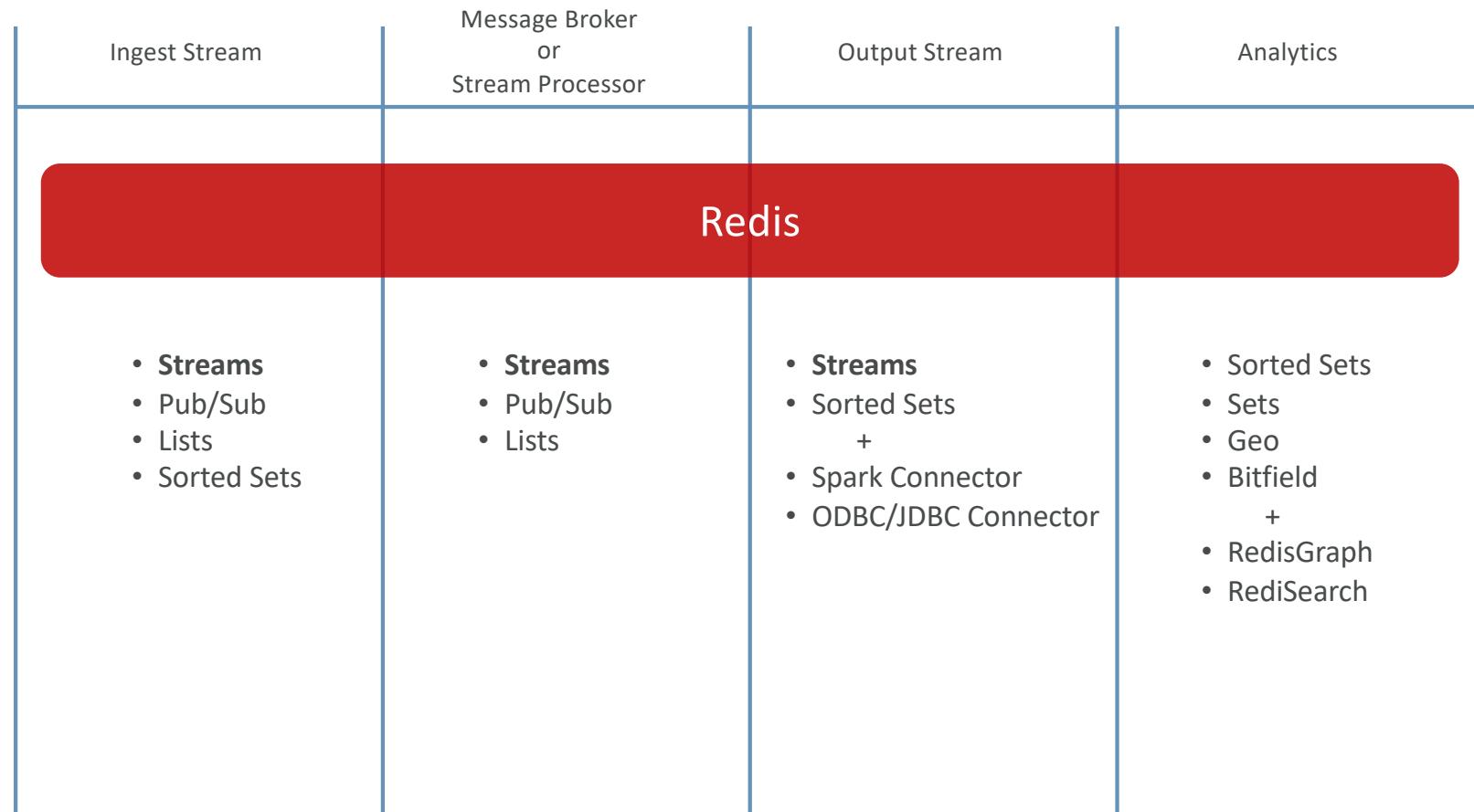


Data Stream Components





Redis Supports All the Functions of a Data Stream



Twitter Ingest Stream

Steam size: 104956

```

Make person tell Valverde say Willian still dey market.
People are so defensive out here. You can't say anything without a person almost coming at you will a knife or
some... https://t.co/jwFg7HAoRd
03:41 en Quinta Normal 10-2-1 B4 San Pablo y Ernesto Samitt https://t.co/zpeOVA8Ozq
@paujener_58 @FansLauraBorras Gracias!
Nakakatamad pumasok geez
@Slipmaggot8 Now that's some factual bullshit
Are you on your way to work?
@RenAldi_16 @Elviatuzz2 @RudyRoedianto @netmediatama tolong slarin BWF world tour final dong
I'm really not sure how im supposed to recover and move on from this. I feel like another chapter of my life is
jus... https://t.co/3sEBGTMpLc
Dame un beso y decimal chau que si lo pienso dos tres veces me arripiento asi soy yo!!!!
03:41 en Quinta Normal 10-2-1 B4 San Pablo y Ernesto Samitt https://t.co/Y4y75cSuMp
@GoldFin82615441 ありがとうございます。額縁のタカハシ 松本店で、11月30日～12月4日までです。急な用事
がない限り在廊しています。どうぞご高覧下さい😊
@BiggBoss849 @TheKhbr @manupunjabim3 https://t.co/4YDjsqB1Oy
@gohanda0630 私も久しぶりに布団で寝寝 😊 😊 してました 😊
Tukijitoa nani atabaki sasa? au ulimanisha tujitolee kama tunavyojitelea hela yetu ya pension na export levy ya
cal... https://t.co/m3C6XH3eiH
@un_chinois_noir @_terezuss Mdddddr elle est pas prête
No se puede confiar en alguien que se llame Doby y use mechaz en pleno 2018.
@ArvindKerjwal AAP AAP hai ,hum hum hai ,kuch sarmje hum mey aur AAP mey kya farak hai .😢
There's a guy works down the White House swears he's Elvis, but he's a liar.....
@Mahmoud59753309 ایورہ بے اسکے محدود اہل ائکر ٹھیکانے اہم حاجہ ائکھے الحڑے و رحب الدیر لئے
https://t.co/WyTLJvF3RW

```

Influencer Catalog

Influencers: 2289

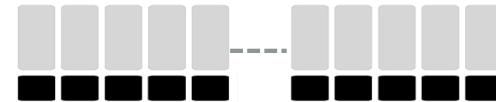
New Influencers

Zezo_rmd	Followers: 32183
WinkWestwood	Followers: 11337
PoojaOnTV	Followers: 18090
TerranGregory	Followers: 26799
Radio_Emergencij	Followers: 44188
AlvaroMolinaCL	Followers: 15767
melbardisi1	Followers: 26305
melbardisi1	Followers: 26305
ladivaza	Followers: 2298390
CTDOT_Statewide	Followers: 10399

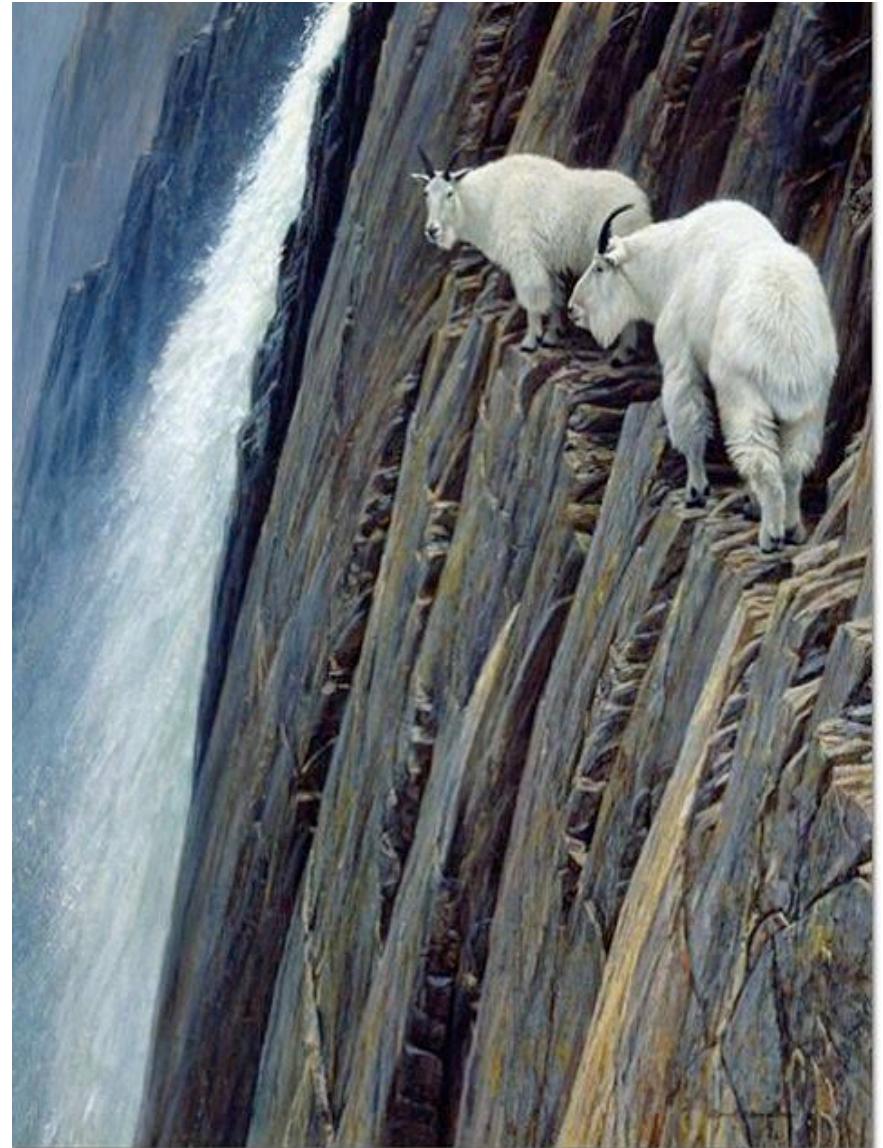
Top Influencers

Handle	# Followers
Lakers	7461113
FaZeClan	3469368
biobio	2802204
Alex10	2679175

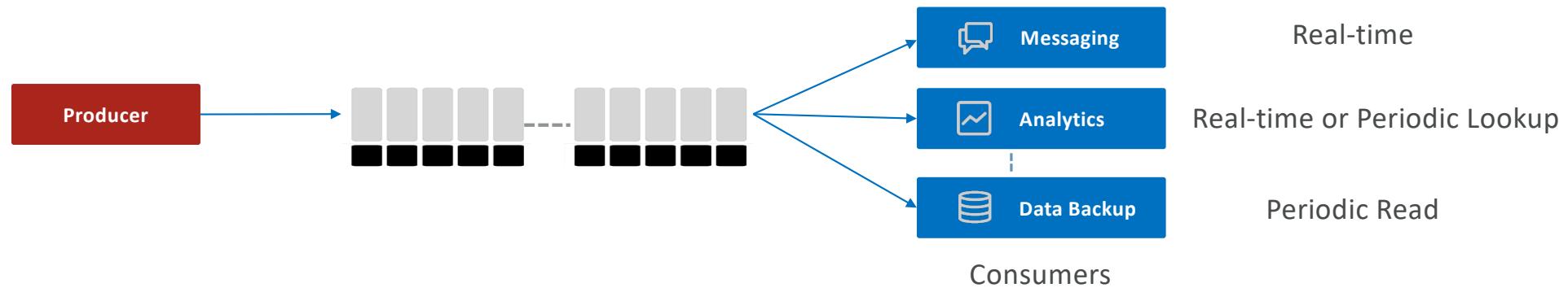
Understanding Redis Streams



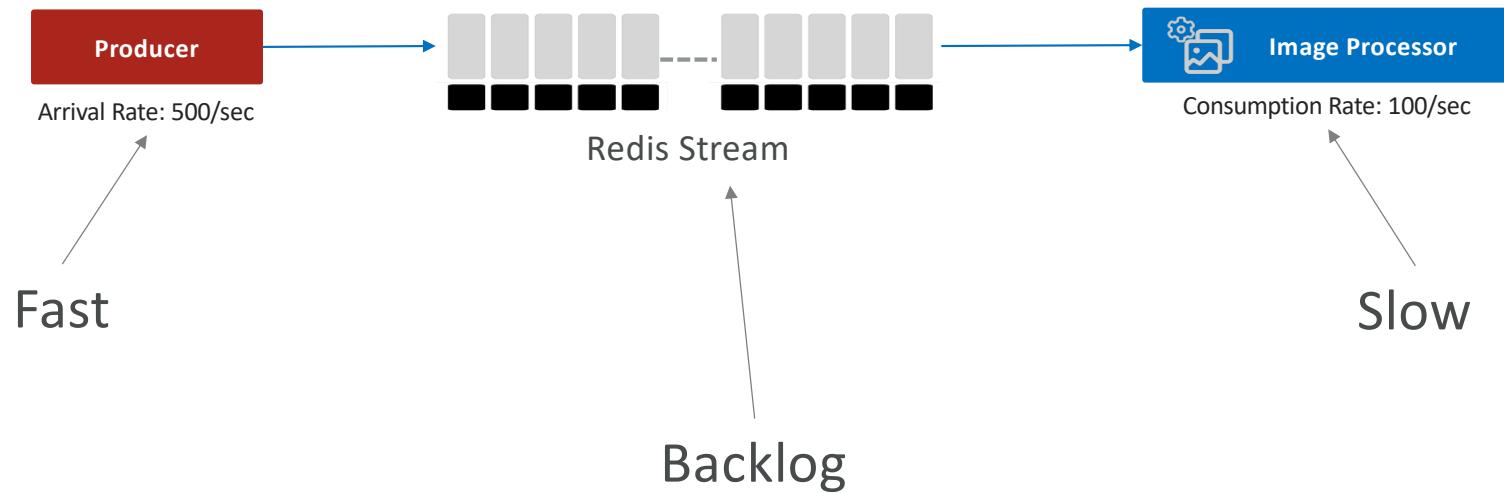
Let's look at the challenges first



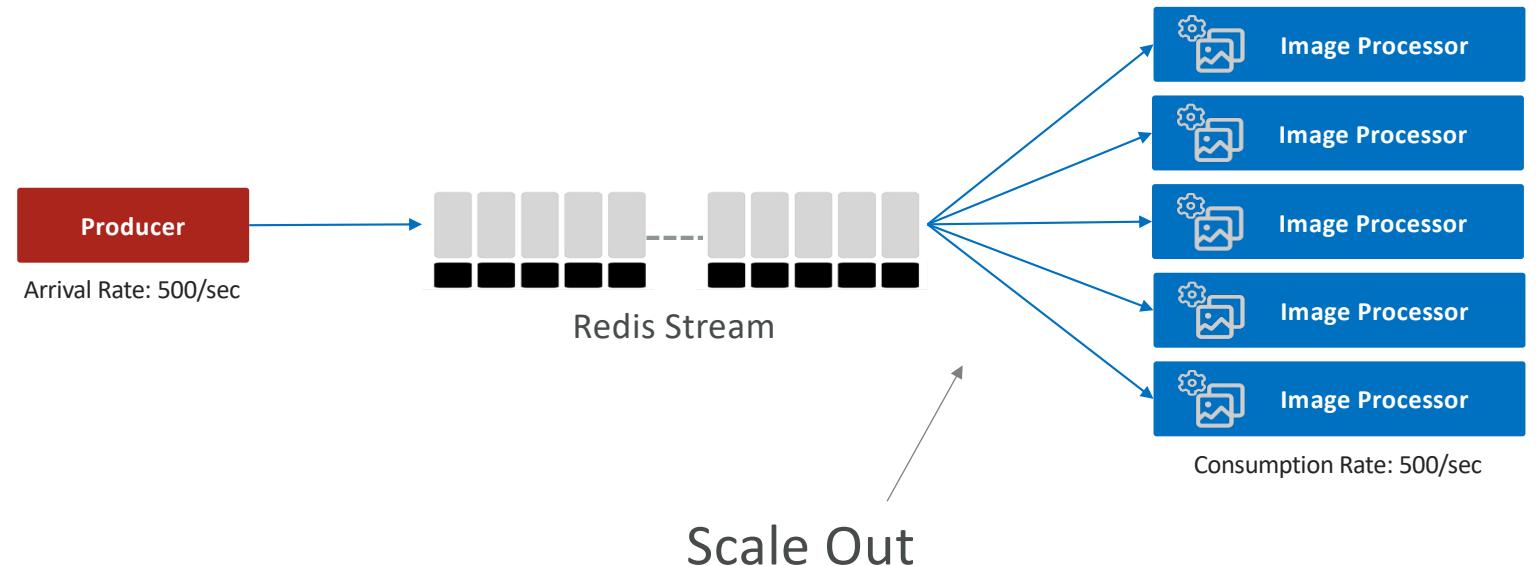
How to Support a Variety of Consumers



The Catch Up Problem

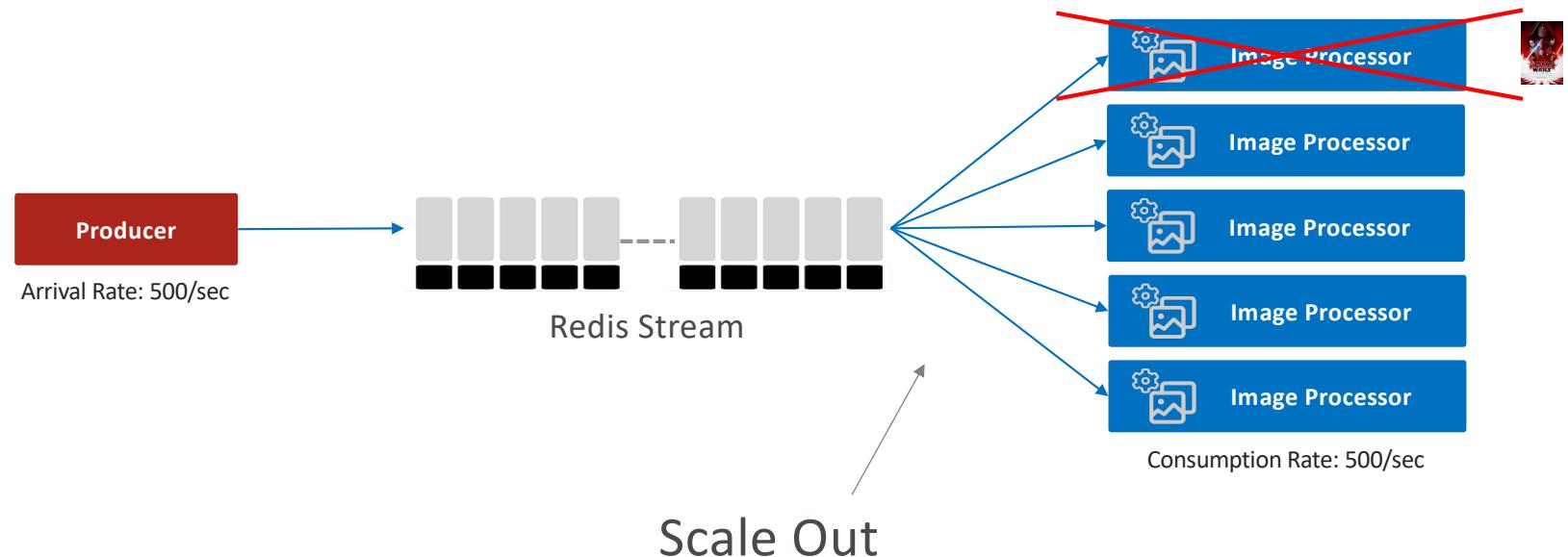


How to Address The Catch Up Problem?



New Problem: Mutual Exclusivity

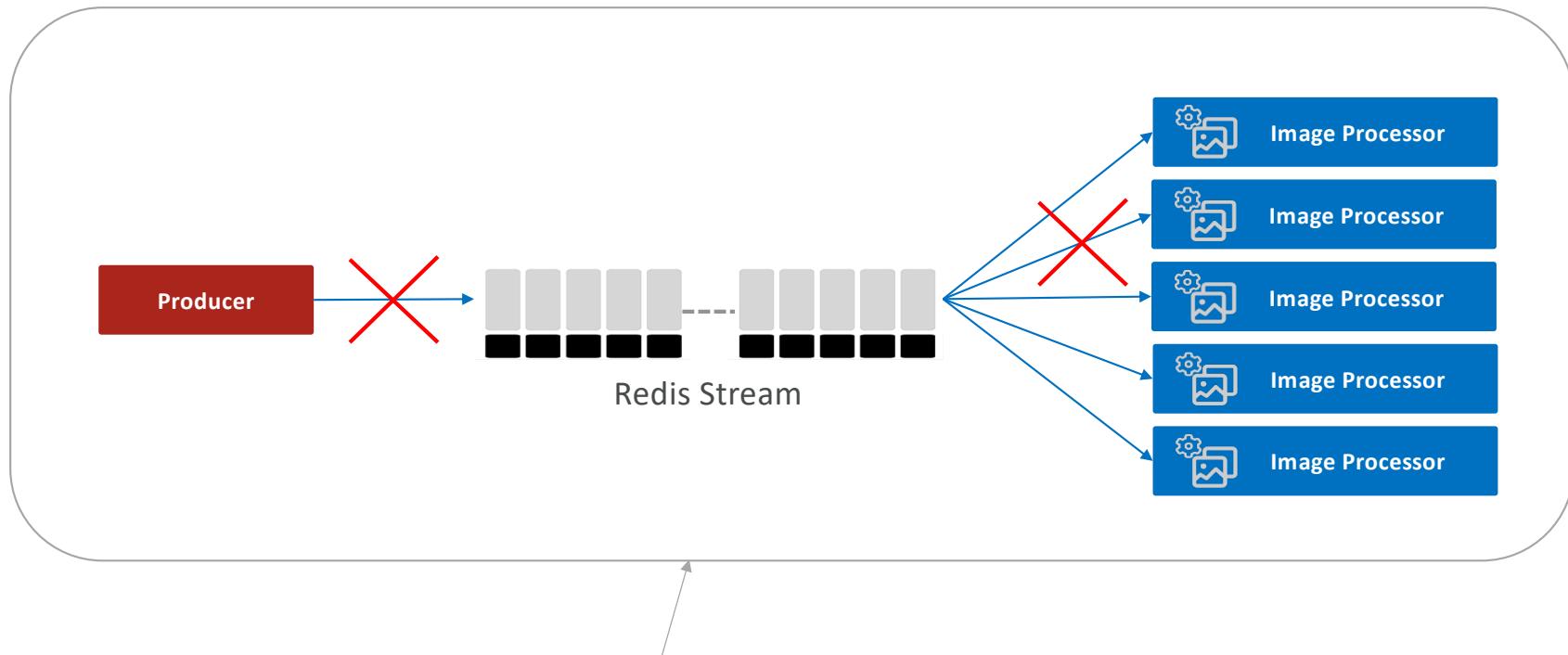
Data Recovery from Consumer Failures



Yet Another Problem: Failure Scenarios



Connection Failures

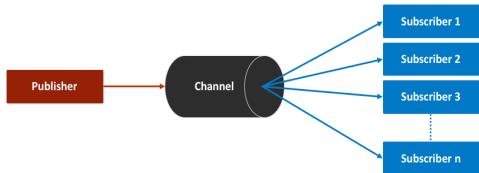


The solution must be resilient to failures

Here comes Redis Streams

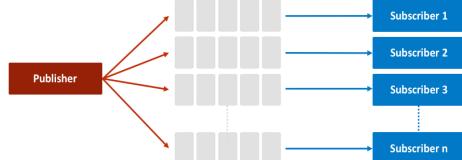


What is Redis Streams?



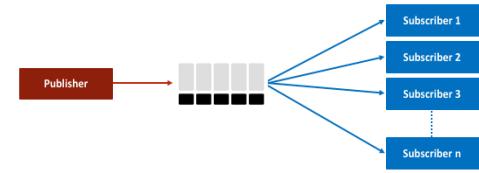
Pub/Sub

It is like Pub/Sub, but with persistence



Lists

It is like Lists, but decouples producers and consumers



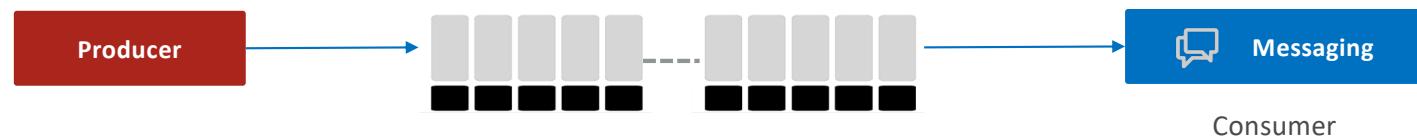
Sorted Sets

It is like Sorted Sets, but asynchronous

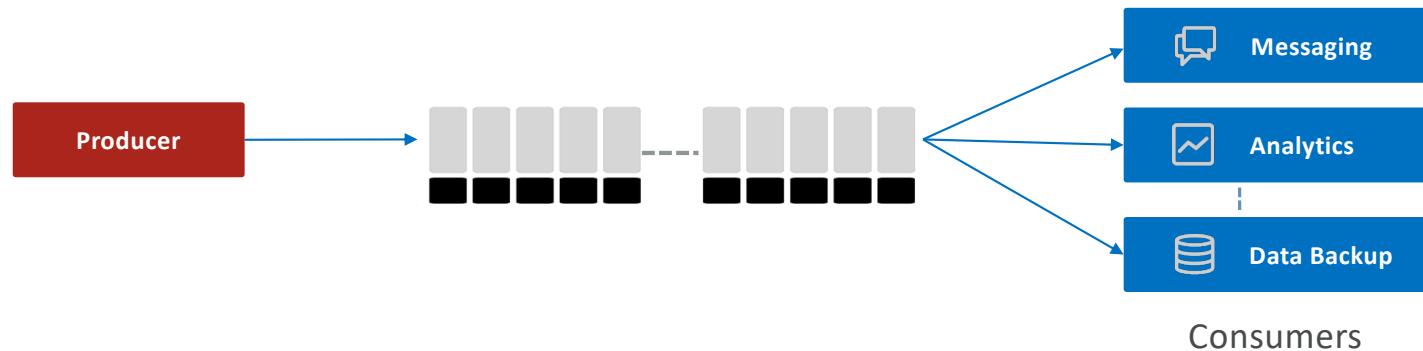


- Lifecycle management of streaming data
- Built-in support for timeseries data
- A rich choice of options to the consumers to read streaming and static data
- Super fast lookback queries powered by radix trees
- Automatic eviction of data based on the upper limit

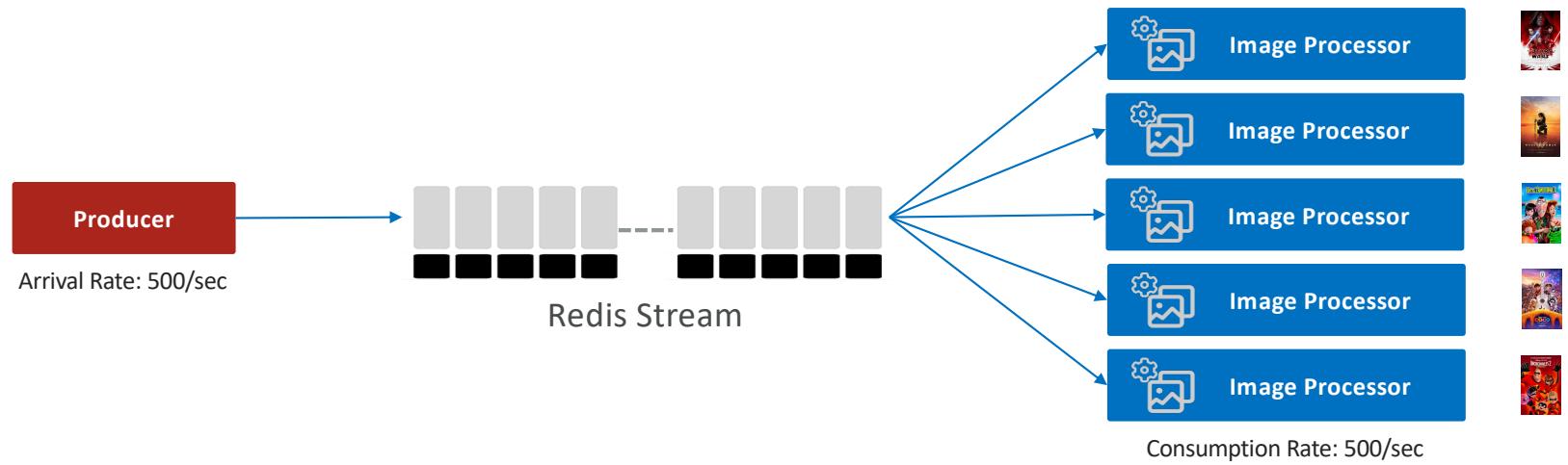
1. It enables asynchronous data exchange between producers and consumers



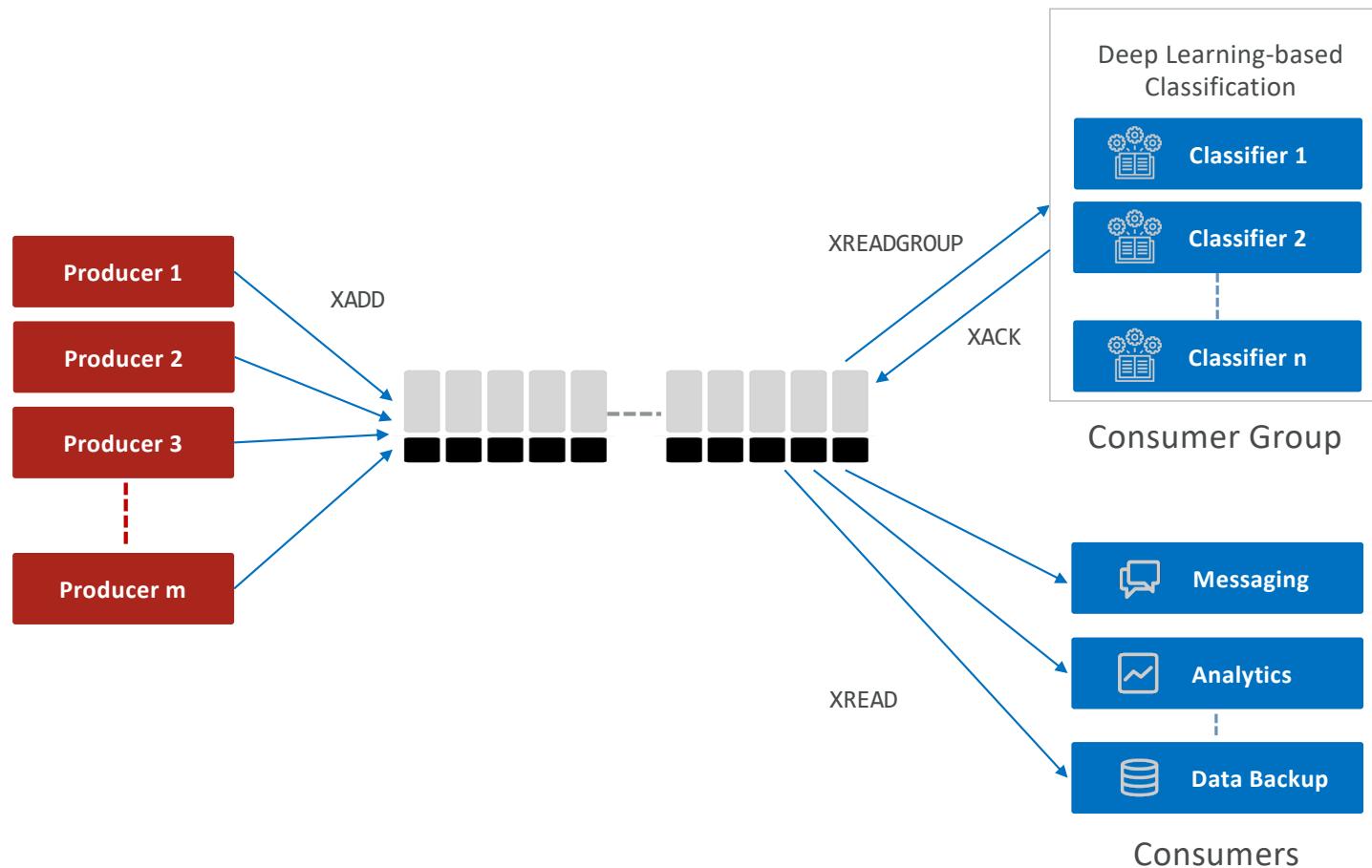
2. You can consume data in real-time as it arrives or lookup historical data



3. With consumer groups, you can scale out and avoid backlogs



4. Simplify data collection, processing and distribution to support complex scenarios



Redis Streams Commands

Quick Reference Guide: <https://redislabs.com/docs/getting-started-redis-streams/>

XINFO [CONSUMERS key groupname]...

Get information on streams and consumer groups

XADD key ID field string [field...]

Appends a new entry to a stream

XTRIM key MAXLEN [~] count

Trims the stream to (approximately if '~' is passed) a certain size

XDEL key ID [ID ...]

Removes the specified entries from the stream. Returns the number of items actually deleted, that may be different from the number of IDs passed in case certain IDs do not exist

XRANGE key start end [COUNT cou...

Return a range of elements in a stream, with IDs matching the specified IDs interval

XREVRANGE key end start [COUNT...

Return a range of elements in a stream, with IDs matching the specified IDs interval, in reverse order (from greater to smaller IDs) compared to XRANGE

XLEN key

Return the number of entries in a stream

XREAD [COUNT count] [BLOCK milli...

Return never seen elements in multiple streams, with IDs greater than the ones reported by the caller for each stream. Can block.

XGROUP [CREATE key groupname id...

Create, destroy, and manage consumer groups.

XREADGROUP GROUP group consume...

Return new entries from a stream using a consumer group, or access the history of the pending entries for a given consumer. Can block.

XACK key group ID [ID ...]

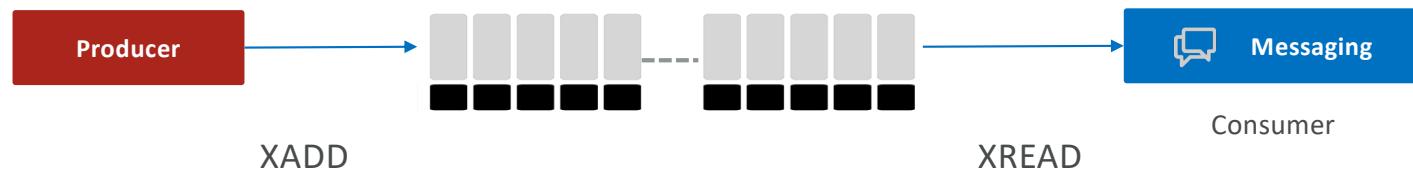
Marks a pending message as correctly processed, effectively removing it from the pending entries list of the consumer group. Return value of the command is the number of messages

XCLAIM key group consumer min-i...

Changes (or acquires) ownership of a message in a consumer group, as if the message was delivered to the specified consumer.

Commands: XADD, XREAD

Asynchronous producer-consumer message transfer

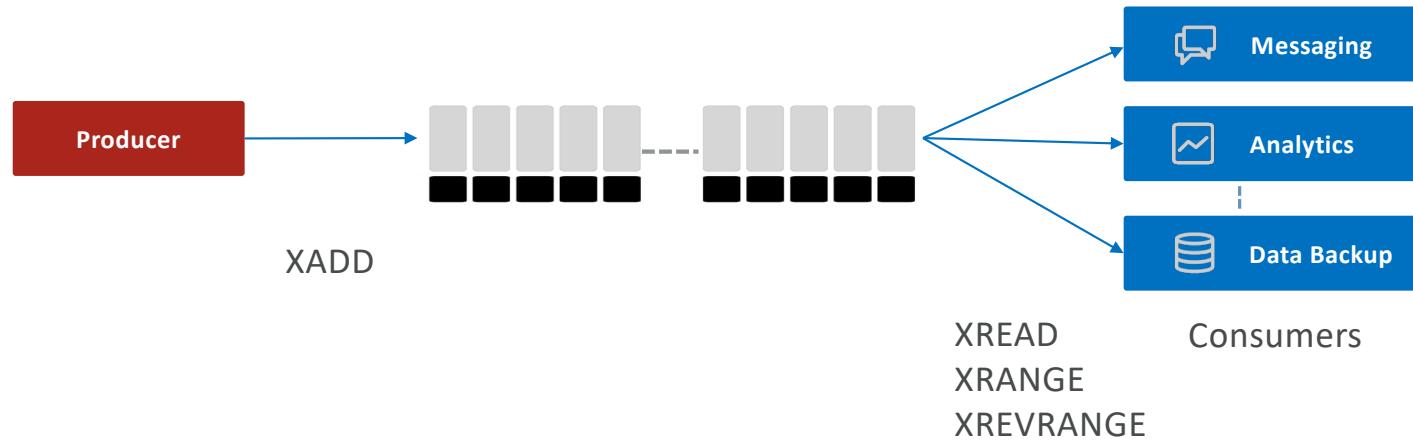


```
XADD mystream * name Anna  
XADD mystream * name Bert  
XADD mystream * name Cathy
```

```
XREAD COUNT 100 STREAMS mystream 0  
XREAD BLOCK 10000 STREAMS mystream $
```

Commands: X RANGE, XREVRANGE

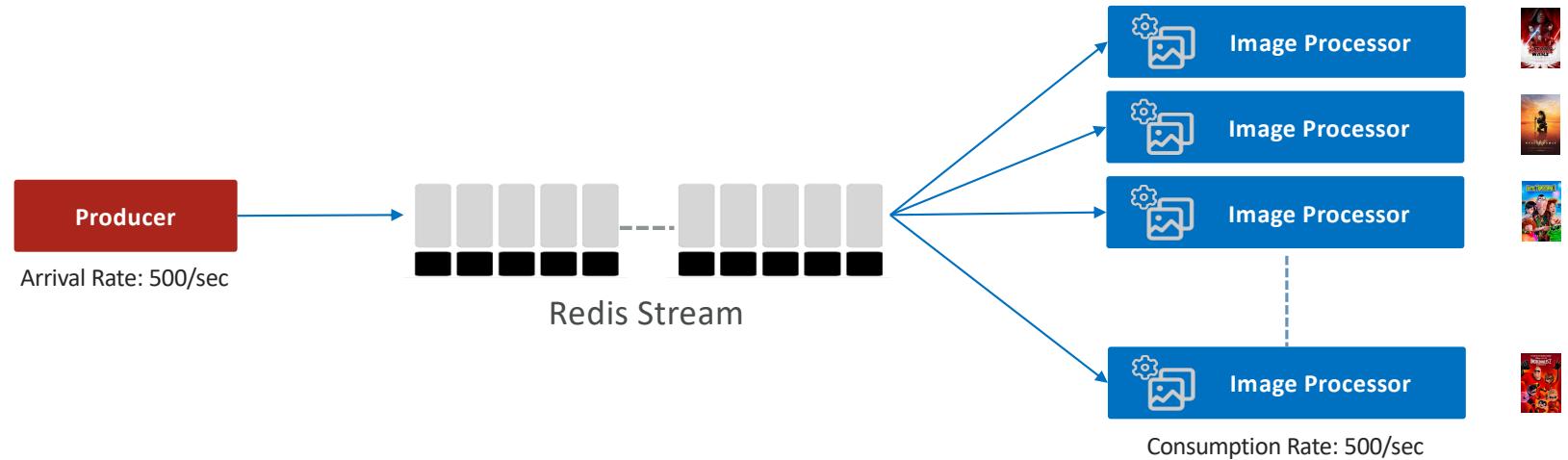
Lookup historical data



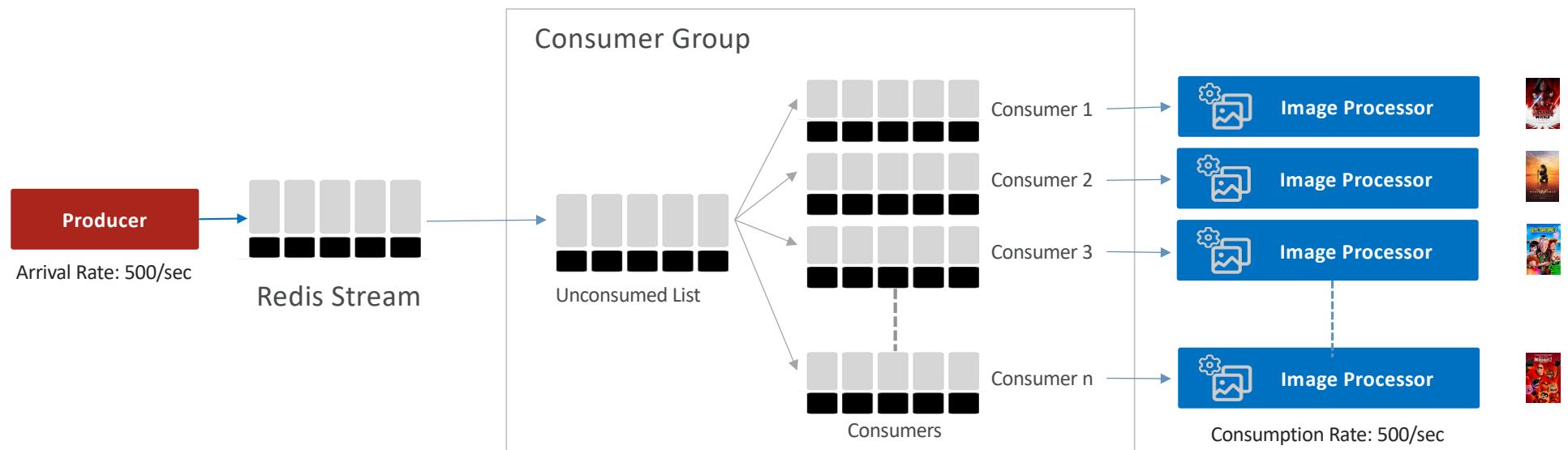
```
X RANGE mystream 1518951123450-0 1518951123460-0 COUNT 10
```

```
X RANGE mystream - + COUNT 10
```

Scaling out using consumer groups



Scaling out using consumer groups



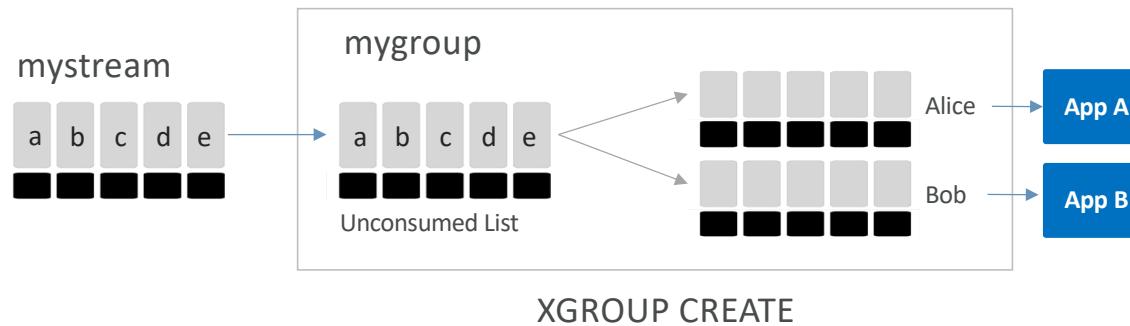
XADD

XGROUP

XREADGROUP
XACK
XPENDING
XCLAIM

Command: XGROUP CREATE

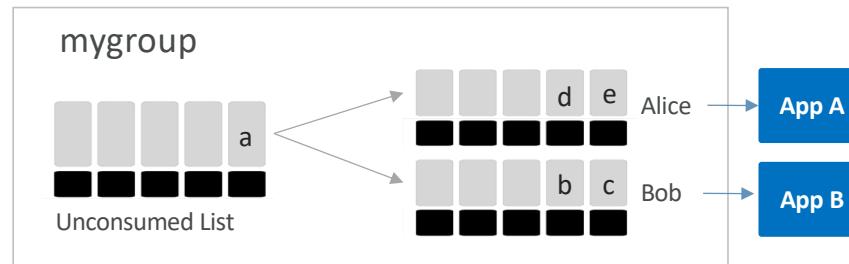
Create a consumer group



```
XGROUP CREATE mystream mygroup $ MKSTREAM
```

Command: XREADGROUP

Read the data



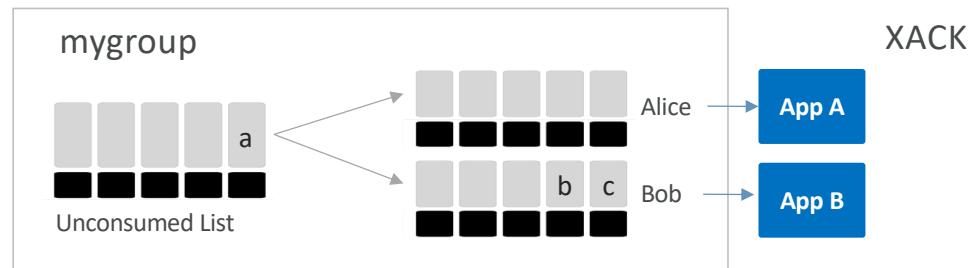
XREADGROUP

```
XREADGROUP GROUP mygroup COUNT 2 Alice STREAMS mystream >
```

```
XREADGROUP GROUP mygroup COUNT 2 Bob STREAMS mystream >
```

Command: XACK

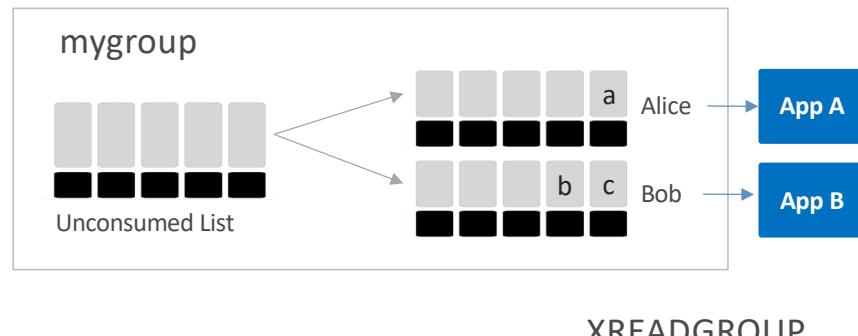
Consumers acknowledge that they consumed the data



```
XACK mystream mygroup 152656941111-0 1526569411112-0
```

Command: XREADGROUP

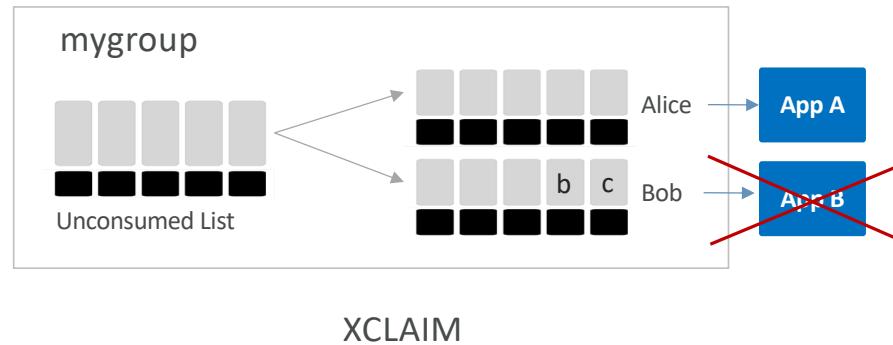
Repeat the cycle



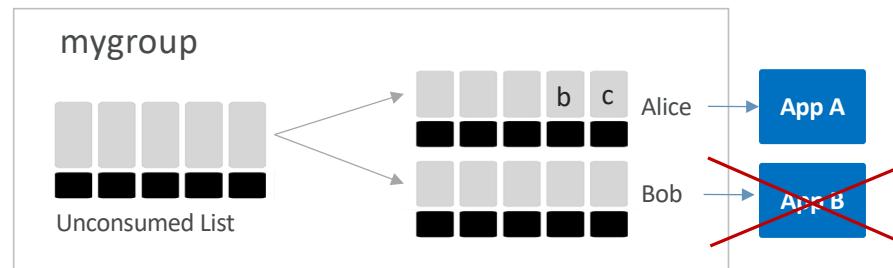
XREADGROUP

```
XREADGROUP GROUP mygroup COUNT 2 Alice STREAMS mystream >
```

How to claim the data from a consumer that failed while processing the data?

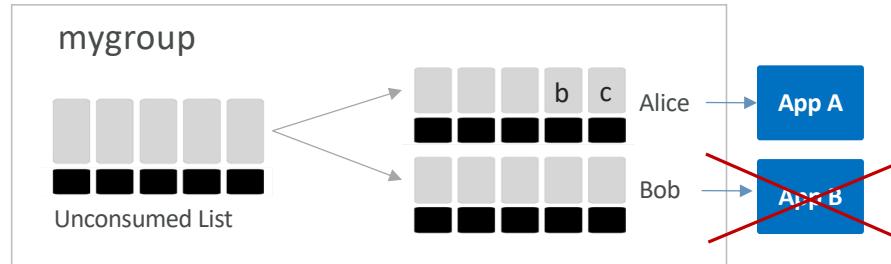


XCLAIM



Commands: XPENDING, XCLAIM

Claim pending data from other consumers



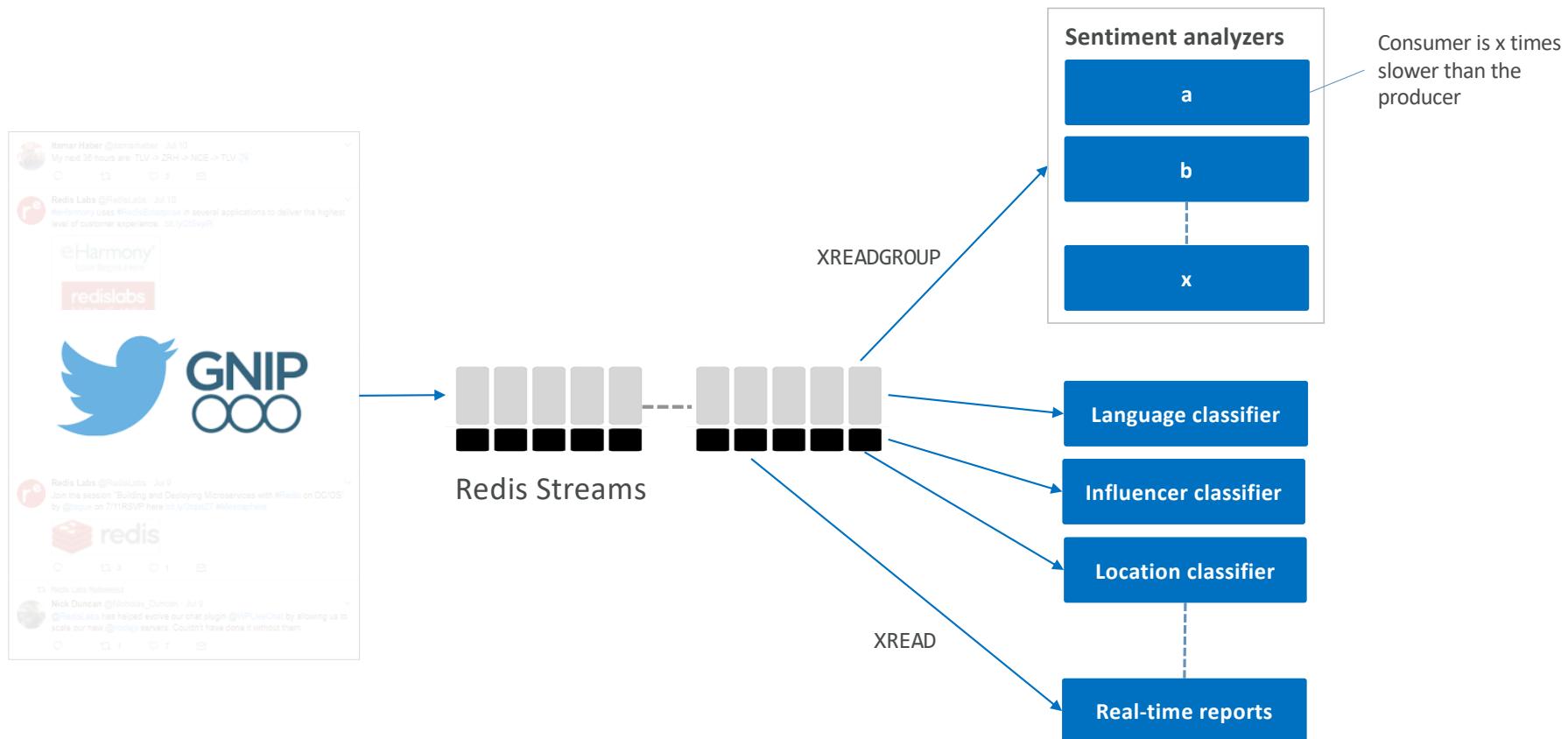
```
XPENDING mystream mygroup - + 10 Bob
```

```
XCLAIM mystream mygroup Alice 0 1526569411113-0 1526569411114-0
```

Now is the time to



Sample Use Case: Social Media Analytics



Demo

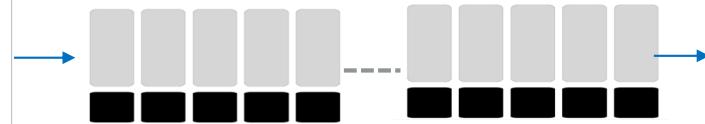
Twitter Ingest Stream

Twitter Ingest Stream

Stream size: 74930

20 years old. Flip me. <https://t.co/8D7GNIoIY>
@07089pxCkRfW @comechanic ぜひ、お越しください! お待ちしております!! !
@lcoastrana @ELTIEMPO Que paz tan sucia y cochina nos dejó @JuanManSantos pero eso si salió con tulas de billetes Nasida güeziz <https://t.co/p0XKn0a01>
@LumiDeLaGasper Jajaja no me hagas hablar por favor
Nike's on my feet was my shit #MacMiller
Been exercising lately 😊 & the only thing that makes me feel better is food... about to gain back all the weigh...
<https://t.co/2tqzVwvPwK>
Gracias a todos por sus bellas palabras ahora mi madre ya está descansando en paz y con la tranquilidad que todo su...
<https://t.co/W9QToWenm9>
@TheTattooedProf Was Yoshi quoted too?
@CBCCalgary Look good on ya, Merchant
@RobonIM 謹慎かそりさん、田中裕也です。総54人に、言います。総54人、田中裕也、LIVE中継、頑てください。
<https://t.co/MSQODjJwW>
Agradecemos a todos los que se han quedado con nosotros durante el año pasado. Gir! can't get a break.
Esas milas querían acabar c minha vida kkk
Acabei de ler no Facebook um texto de um homem dizendo que ninguém deve meter a coher nas relações dos outros como...
<https://t.co/YuRP7XPJu>
Wind 0.0 kts SE. Barometer 1022.0 hPa, Rising slowly. Temperature 14.3 °C. Rain today 0.0 mm. Humidity 94%
@Telenoticiasrd la comunidad del Res. Regina Autopista de San Isidro está en las calles por la burda de @EdecenterRD...
<https://t.co/Rai80WZfY>
"Aşalım: çünkü carin ne zaman isterse o zaman gelin ve ben hiçbirine hayır diyemedim." - Love and Other Drugs
V Soccer up 3-0 with 6 minutes remaining @Woodberry Forest 🏈
Al final terminamos hablando y deseandnos cosas lindas. Pero no lo tomes a mal. Solo es mi pensar de una persona q...
<https://t.co/MiL374NleU>





Redis Streams

Influencer Classifier

Influencer Catalog

Influencers: 1634

New Influencers

UnderstandTrap	Followers:22309
flynavy	Followers:59489
horanlezadoj	Followers:12695
tomocates1	Followers:37049
philipnolan1	Followers:14963
IncredibleZen	Followers:28584
belinha_inez	Followers:10542
mrcsuperfreq	Followers:11189
marcellomusic1	Followers:32748
Kendrotamundos1	Followers:15259

Top Influencers

Handle	# Followers
FaZeCian	3469368
biobio	2802204
Alex10	2679175
PierreMenes	2432190
BluRadioCo	2222054
MercedesAMGF1	2136209
hilalstuff	1941941
THEBEAT999FM	1891005
OVIACDMX	1695952
DJFreshSA	1647356

<https://github.com/redislabsdemo/IngestRedisStreams>



Redis Clients that Support Redis Streams

Java	Jedis	https://github.com/xetorthio/jedis
	Lettuce	https://lettuce.io/
Python	redis-py	https://github.com/andymccurdy/redis-py
JavaScript	ioredis	https://github.com/luin/ioredis
	node_redis	https://github.com/NodeRedis/node_redis
.NET	StackExchange.Redis	https://github.com/StackExchange/StackExchange.Redis
Go	redigo	https://github.com/gomodule/redigo
	go-redis	https://github.com/go-redis/redis
C	Hiredis	https://github.com/redis/hiredis
PHP	predis	https://github.com/nrk/predis
	phpredis	https://github.com/phpredis/phpredis
Ruby	redis-rb	https://github.com/redis/redis-rb

Questions?

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[@davenielsen](https://twitter.com/davenielsen)

Thanks to @roshankumar for the demo

