Introducing Data Downtime: From Firefighting to Winning

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When your CEO or customer says the data is wrong...



Unreliable data is more prevalent than we admit



Google's Bad Data Wiped Another Neighborhood Off the Map (n



Posted by EditorDavid on Saturday March 16, 2019 @09:34PM from the feeling-unlucky dept.

Current solutions take heroic (or tedious) efforts



"Each data engineer adds monitoring and basic checks to their pipelines, but it's all manual."

Engineering Manager, 1500 person tech co DAG that t rate valid QL que analys ob of wh me lolo *"We've been building out data monitoring solutions for the last year and FINALLY we're in a good place."*

Engineering Manager, 300 person tech co

"Data downtime" refers to periods of time when

your data is partial, erroneous, missing or otherwise

inaccurate.

Signs you're experiencing data downtime



Your data team spends >10% of time on fire drills



(!) Your company lost \$\$ because data was broken



Critical analysis fails because missing data went unnoticed



Troubleshooting involves tedious step-by-step debugging

What can we do about it?

If you care about the data industry, make data downtime mitigation part of your culture

- Team SLAs
- Weekly meetings
- Post-mortems
- Pay data debt



World-class companies mitigate data downtime





Examples:



Manual tracking & detection

- Generate the data more frequently than you need it
- Manually write data QA queries and alert on it
- Track time stamps to ensure data isn't stale
- Validate row counts in critical stages of pipeline

Example #1: Validate row counts in critical stages of pipeline



Validate number of rows for key tables (e.g. website visitors) is within reasonable range

Consider failing the job vs. generating a warning/alert

Example #1: Validate row counts in critical stages of pipeline



Example #1: Validate row counts in critical stages of pipeline

• Particularly effective when

- Row count is somewhat predictable
- Problems tend to result in substantial missing or duplicated data

• Limitations

- Could require tuning and maintenance
- Sensitive to seasonality
- Doesn't catch all issues



Examples:



Programmatic enforcement

- Automatically track metrics about dimensions & measures, compare to past periods
- Create a data health dashboard
- Document fields and tables
- Monitor/enforce schema and validity of upstream

Example #2: Monitor/enforce schema and validity of upstream

- Why
 - Data sources change (e.g. engineering pushes schema change)
 - Data team does not control and has no visibility
- How
 - Define expected schema
 - Validate data against schema before processing
 - Discard or alert on data that doesn't match

Example #2: Monitor/enforce schema and validity of upstream

		ŧ	Protocols Kicks App Tracking Plan				Validate Data
Kicks App 🖌							
🔹 🔶 2 Connected Sources						Add Event Delete	
Q Filter all Events			Description	Status		Data Type	
Product Shared	*	۲	Fire this event when a customer shares a product.			View Code Snippet	0
product_id			Database ID of the product being viewed	required	*	string	-
product_name			Name of the product being viewed	required	*	string	
recipient			Recipient of the sharing	required	*	string	•
share_via			Method of sharing	required	*	string	*
Order Completed		۲	An order has been completed				
checkout_id			Checkout ID	required	*	string	-
coupon			Transaction coupon redeemed with the transaction	optional	*	string	•
order_id			Order/transaction ID	required	-	string	-
revenue			Revenue associated with the transaction (excluding shipping and tax)	optional	•	number	•
shipping			Shipping cost associated with the transaction	optional	*	number	*
tax			Total tax associated with the transaction	optional	•	number	•
total			Revenue with discounts and coupons added in. Note that our Google	required	•	number	•

Example #2: Monitor/enforce schema and validity of upstream >> my_df.expect_column_values_to_be_between(

 Bonus: validate data, not just schema (e.g. great expectations open source)

```
"my_column",
 min_value=0,
 max value=7,
 mostly=0.7
"success": true
"result": {
 "unexpected_percent": 0.2,
 "partial unexpected index list": [
    8,
    9
  "partial_unexpected_list": [
    8,
    9
  "unexpected percent nonmissing": 0.2,
  "unexpected count": 2
```

Source: https://github.com/great-expectations/great_expectations

Example #2: Monitor/enforce schema and validity of upstream

Bonus: automate
 ownership & page the
 right owner (e.g.
 pagerduty alerts)

DAG Failure incident:

Airflow DAG failure: <TaskInstance: rea_test_pager_duty_incident_operator.test_dag_failure_alert 2018-12-05T05:04:26.449535+00:00 [failed]> (ALERT)

Related to Incident: [#42849] Airflow DAG failure: <TaskInstance: rea_test_pager_duty_incident_... (Resolved)

 Severity
 Critical

 Alert Times
 Open from Dec 5, 2018 at 4:04 PM to Dec 5, 2018 at 4:08 PM (for 3 minutes)

 Alert Key
 8df8a9b59bd746cc949df93a72eec2a3

Current Status Resolved

Service Name Group Technology - DS - SPARC - development Service Description Managed by Terraform Integration Events API v2

> Source http://localhost:8080 Component Airflow Worker Class DAG Failure



Examples:

Scalable

Substantial, embedded coverage

- Validate measures across different tables, sources
- Track and annotate data issues and questions
- Create reusable components to calculate metrics
- Setup a staging environment that closely resembles production
- Embed automated data validation code across your pipeline

Example #3: Embed automated data validation code across your pipeline

Apache Griffin Architecture



Example #3: Embed automated data validation code across your pipeline

Case in Point: Netflix's RAD

browser

- Need to validate 10000s of metrics, with seasonality
- RPCA algorithm to detect time series anomalies
- Pig wrapper allows pipeline engineers to validate key metrics
- Success with (a) transaction data per banking institution (b) sign up conversion by country and



Source: https://medium.com/netflix-techblog/rad-outlier-detection-on-big-data-d6b0494371cc

World-class companies mitigate data downtime



Your company will kickass if you figure this out

- Minimize fire drills
- Gain confidence
- Make better decisions
- Move faster



Join the data downtime movement.

Connect with me @barrmoses on Medium or LinkedIn

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Entrepreneur. Former VP at Gainsight.

