Time Travel with SQL Server

Joel Gallagher

Joel Gallagher

- Melbourne < ~ > Málaga
- Full Stack Developer
- Data, Dev, DevOps
- Speaker & Trainer

MICROSOFT CERTIFIED PROFESSIONAL
Microsoft
MCSA
SQL Database Development
Earned 2019

✉	joel@joelgallagher.com
🐦	@joelgall
in	linkedin.com/in/joelgallagher/
	github.com/JoelGallagher/TimeTravelWithSqlServer

Temporal Tables

- Azure SQL
- SQL Server 2016 +

What are Temporal Tables?

Temporal Tables

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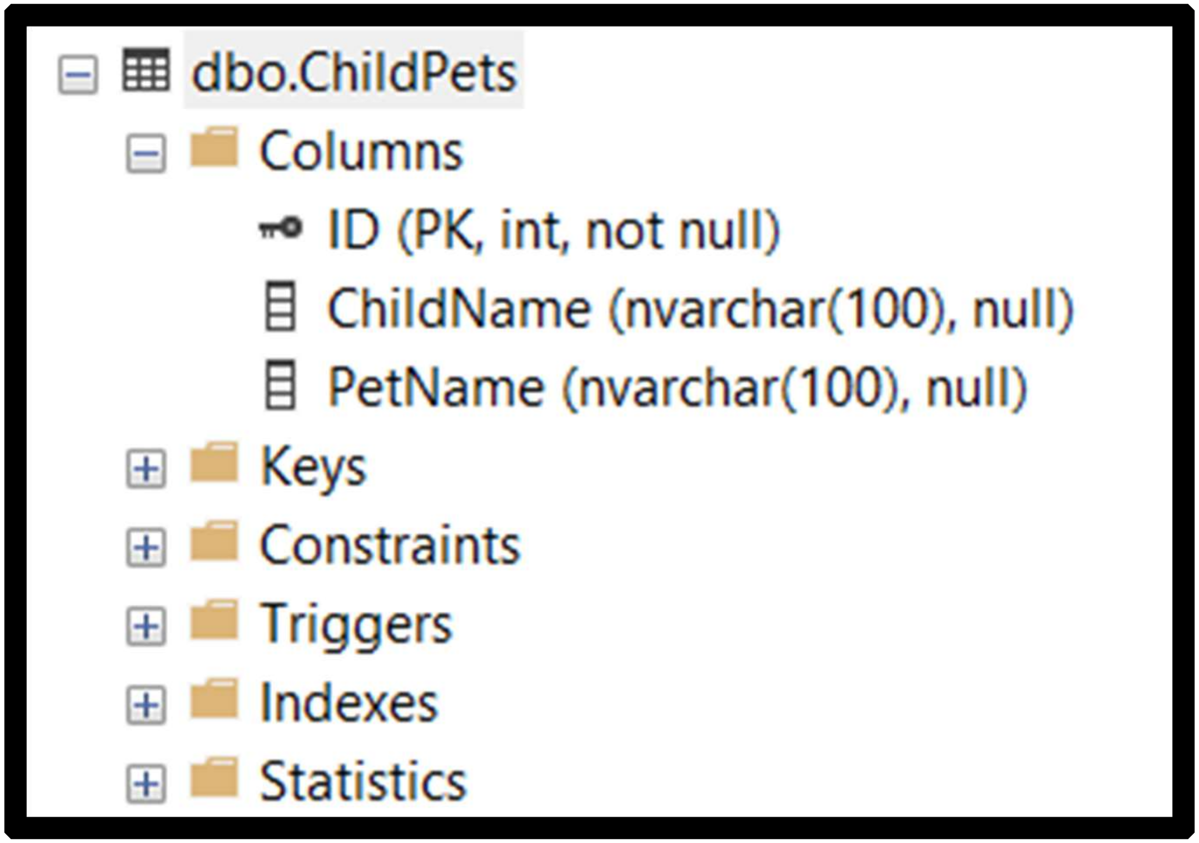
Temporary Tables

Standard Table

ChildPets

ID	ChildName	PetName
1	Tom	Max
2	Isabella	Fido



```
⊟ dbo.ChildPets
    ⊟ Columns
          ID (PK, int, not null)
          ChildName (nvarchar(100), null)
          PetName (nvarchar(100), null)
    ⊞ Keys
    ⊞ Constraints
    ⊞ Triggers
    ⊞ Indexes
    ⊞ Statistics
```

Temporal Tables

ChildPets

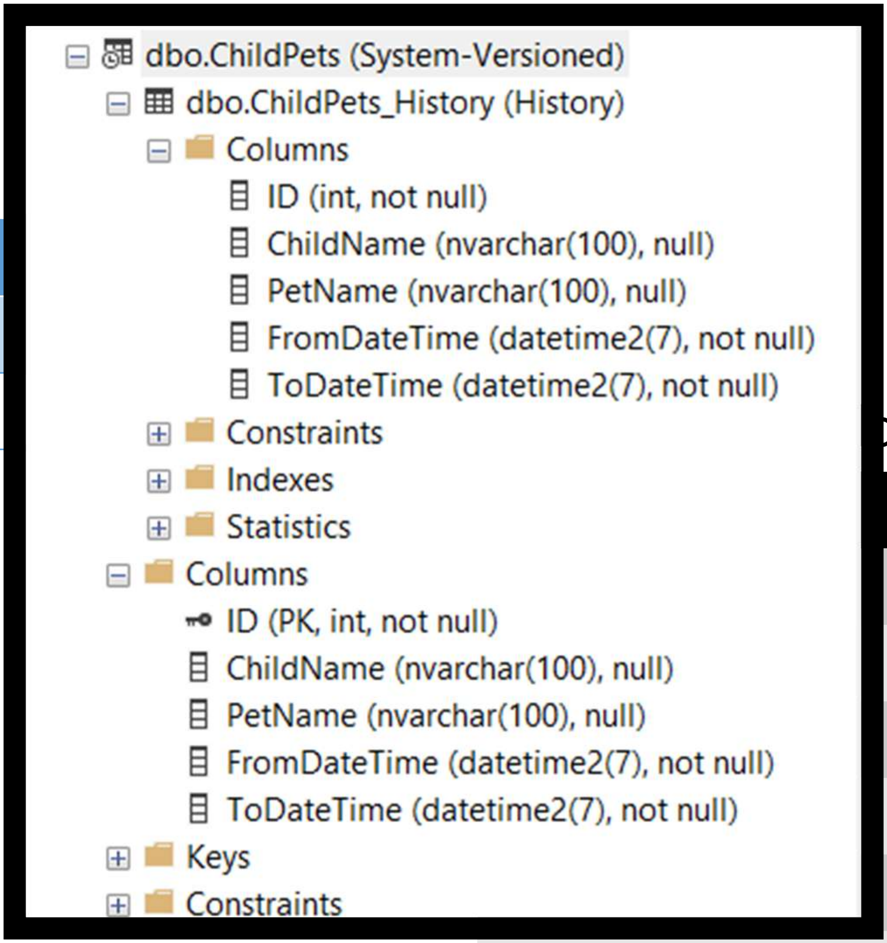
ID	ChildName	PetName	From	To
1	Tom	Max	1/1/2019	31/12/9999
2	Isabella	Fido	1/4/2019	31/12/9999

ChildPets_History

ID	ChildName	PetName	From	To
1	Tom	Buffy	1/1/2010	1/1/2011
1	Tom	Draco	1/1/2011	1/6/2012
1	Tom		1/6/2012	3/8/2015
2	Isabella	Scruffy	1/2/2013	3/9/2016
1	Tom	Zack	3/8/2015	12/9/2016
2	Isabella	Ruffy	3/9/2016	1/4/2019
1	Tom	Jackie	12/9/2016	1/1/2019

ChildPets

ID	ChildName	PetName
1	Tom	Max
2	Isabella	Fido



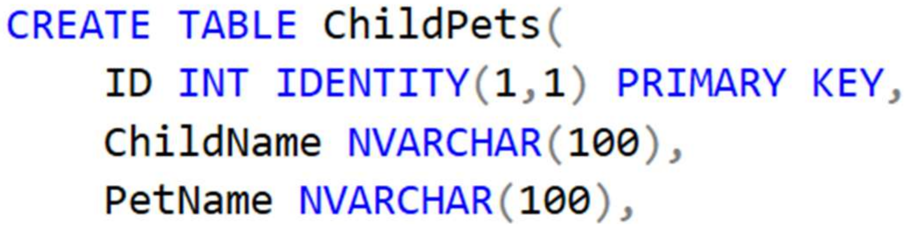
- dbo.ChildPets (System-Versioned)
  - dbo.ChildPets_History (History)
    - Columns
      - ID (int, not null)
      - ChildName (nvarchar(100), null)
      - PetName (nvarchar(100), null)
      - FromDateTime (datetime2(7), not null)
      - ToDateTime (datetime2(7), not null)
    - Constraints
    - Indexes
    - Statistics
  - Columns
    - ID (PK, int, not null)
    - ChildName (nvarchar(100), null)
    - PetName (nvarchar(100), null)
    - FromDateTime (datetime2(7), not null)
    - ToDateTime (datetime2(7), not null)
  - Keys
  - Constraints

dPets_History

		PetName	From	To
		Buffy	1/1/2010	1/1/2011
		Draco	1/1/2011	1/6/2012
			1/6/2012	3/8/2015
		Scruffy	1/2/2013	3/9/2016
		Zack	3/8/2015	12/9/2016
2	Isabella	Ruffy	3/9/2016	1/4/2019
1	Tom	Jackie	12/9/2016	1/1/2019

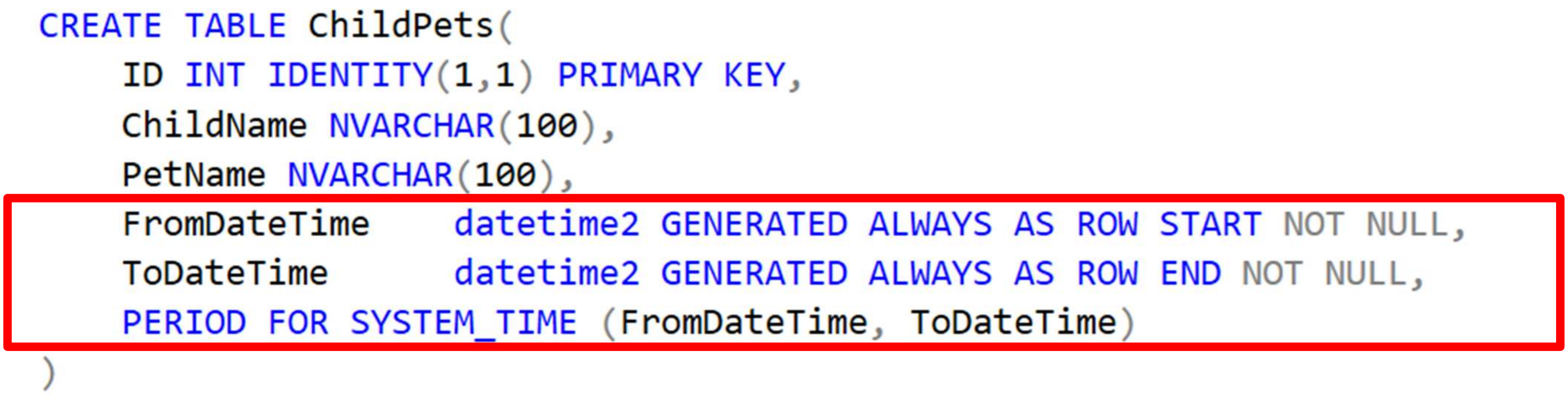
How to use Temporal Tables?

How?



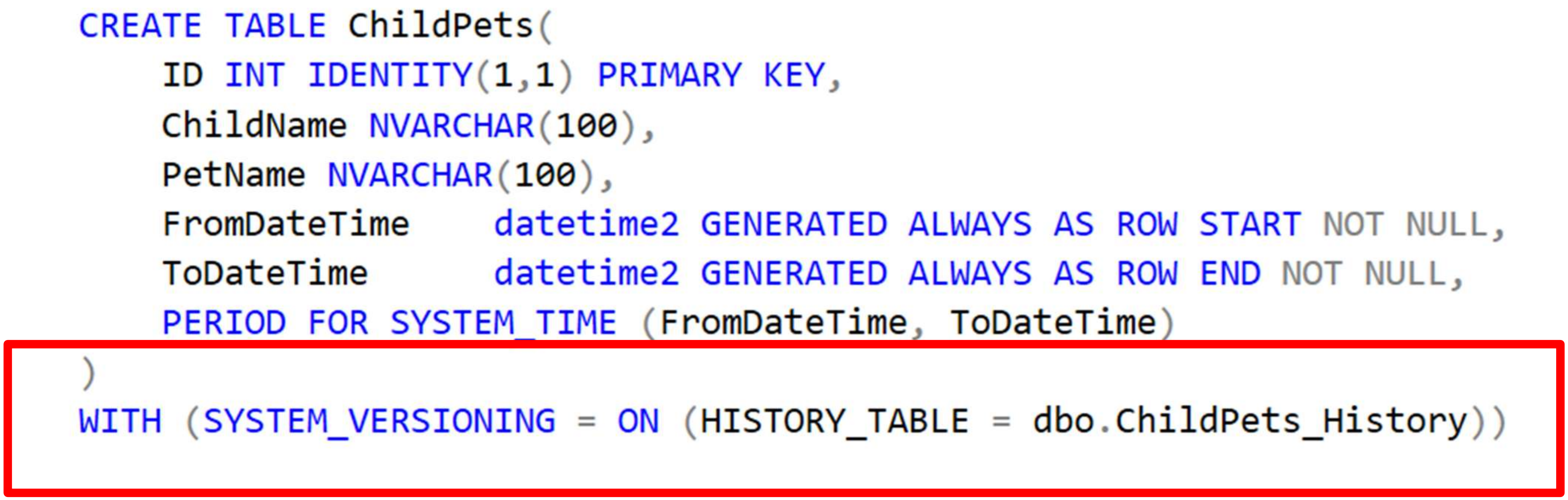
```
CREATE TABLE ChildPets(
    ID INT IDENTITY(1,1) PRIMARY KEY,
    ChildName NVARCHAR(100),
    PetName NVARCHAR(100),
```

How?



```
CREATE TABLE ChildPets(
    ID INT IDENTITY(1,1) PRIMARY KEY,
    ChildName NVARCHAR(100),
    PetName NVARCHAR(100),
    FromDateTime    datetime2 GENERATED ALWAYS AS ROW START NOT NULL,
    ToDateTime      datetime2 GENERATED ALWAYS AS ROW END NOT NULL,
    PERIOD FOR SYSTEM_TIME (FromDateTime, ToDateTime)
)
```

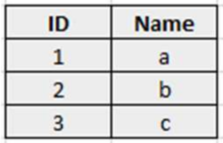
How?



```sql
CREATE TABLE ChildPets(
    ID INT IDENTITY(1,1) PRIMARY KEY,
    ChildName NVARCHAR(100),
    PetName NVARCHAR(100),
    FromDateTime    datetime2 GENERATED ALWAYS AS ROW START NOT NULL,
    ToDateTime      datetime2 GENERATED ALWAYS AS ROW END NOT NULL,
    PERIOD FOR SYSTEM_TIME (FromDateTime, ToDateTime)
)
WITH (SYSTEM_VERSIONING = ON (HISTORY_TABLE = dbo.ChildPets_History))
```

How?

Main



ID	Name
1	a
2	b
3	c

+

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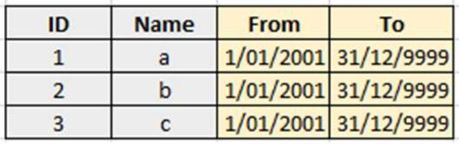
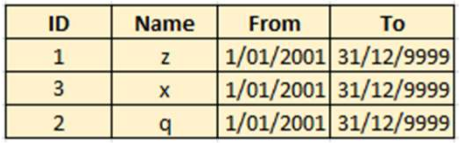
Main



ID	Name	From	To
1	a	1/01/2001	31/12/9999
2	b	1/01/2001	31/12/9999
3	c	1/01/2001	31/12/9999

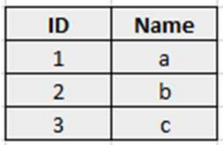
History



ID	Name	From	To
1	z	1/01/2001	31/12/9999
3	x	1/01/2001	31/12/9999
2	q	1/01/2001	31/12/9999

How?

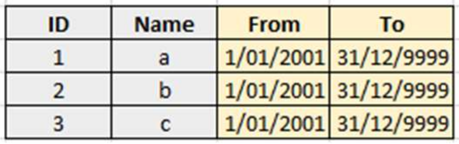
Main



ID	Name
1	a
2	b
3	c

DEMO

Main



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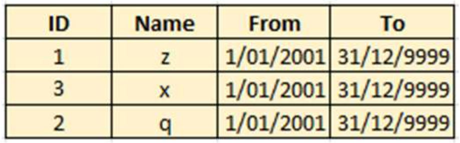
History



ID	Name	From	To
1	z	1/01/2001	31/12/9999
3	x	1/01/2001	31/12/9999
2	q	1/01/2001	31/12/9999

Why use Temporal Tables?

Why?

Standard Tables

ChildName	PetName
Tom	Max
Isabella	Fido

- Lose historical data

Why?

Standard Tables

ChildName	PetName
Tom	Max
Isabella	Fido

- Lose historical data
- Accidental modifications (no rollback)

Why?

Standard Tables

ChildName	PetName
Tom	Max
Isabella	Fido

- Lose historical data
- Accidental modifications (no rollback)
- Hard to report Analytics & Insights

Why?

ID	ChildName	PetName	From	To
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1	Tom	Zack	3/8/2015	12/9/2016
2	Isabella	Ruffy	3/9/2016	1/4/2019
1	Tom	Jackie	12/9/2016	1/1/2019

Temporal Tables

- Point in Time query

Why?

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Temporal Tables

- Point in Time query
- Insights

Why?

ID	ChildName	PetName	From	To
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Temporal Tables

- Point in Time query
- Insights
- Disaster Recovery

Why?

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Temporal Tables

- Point in Time query
- Insights
- Disaster Recovery
- Audit requirements

When?

When?

Syntax	Description
ALL	Every Row in history
AS OF <dt>	Data at this exact point in time
FROM <dt> TO <dt>	Data active at ANY POINT within the date range. Excludes extremes
BETWEEN <dt> AND <dt>	As with FROM, but includes records starting on upper END date.
CONTAINED IN (<dt>, <dt>)	All records that began and ended within the date range

When?

Temporal Insights

Where can I run Temporal Tables?

Where?

Microsoft®
SQL Server®

CONSIDERATIONS

https://learn.microsoft.com/en-us/sql/relational-databases/tables/temporal-table-considerations-and-limitations?view=sql-server-ver16

CONSIDERATIONS

- Data Privacy

https://learn.microsoft.com/en-us/sql/relational-databases/tables/temporal-table-considerations-and-limitations?view=sql-server-ver16

CONSIDERATIONS

- Data Privacy
- Joins between Temporal & Non-Temporal tables

https://learn.microsoft.com/en-us/sql/relational-databases/tables/temporal-table-considerations-and-limitations?view=sql-server-ver16

CONSIDERATIONS

- Tables with Binary, Text, Image will get BIG!

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CONSIDERATIONS

- Tables with Binary, Text, Image will get BIG!
- No Checks, P|F keys on History table

https://learn.microsoft.com/en-us/sql/relational-databases/tables/temporal-table-considerations-and-limitations?view=sql-server-ver16

CONSIDERATIONS

- Tables with Binary, Text, Image will get BIG!
- No Checks, P|F keys on History table
- No **Indexed** Views using Temporal Tables

https://learn.microsoft.com/en-us/sql/relational-databases/tables/temporal-table-considerations-and-limitations?view=sql-server-ver16

SUMMARY

- What
- Why
- How
- When
- Where
- Who

SUMMARY

What

Temporal Table:

A regular table with a

corresponding **_History** table

tracking all historic changes

SUMMARY

Why

- Query data for given points in time
- Analytics & Insights
- Disaster Recovery
- Audit requirements

SUMMARY

How

- Add DateFrom / DateTo to main table.
- Turn on SystemVersioning

SUMMARY

When

Syntax
ALL
AS OF <dt>
FROM <dt> TO <dt>
BETWEEN <dt> AND <dt>
CONTAINED IN (<dt>, <dt>)

SUMMARY

Where

Microsoft®
SQL Server®

SUMMARY

Who

✉	joel@joelgallagher.com
🐦	@joelgall
in	linkedin.com/in/joelgallagher/
🐙	https://github.com/JoelGallagher/TimeTravelWithSqlServer

DOT
NET
MLG

EL EVENTO SOBRE

TECNOLOGÍAS
CLOUD, WEB
Y DATA

Verisk™ SECTOR ALARM prodware LEMONCODE METADEV plain concepts