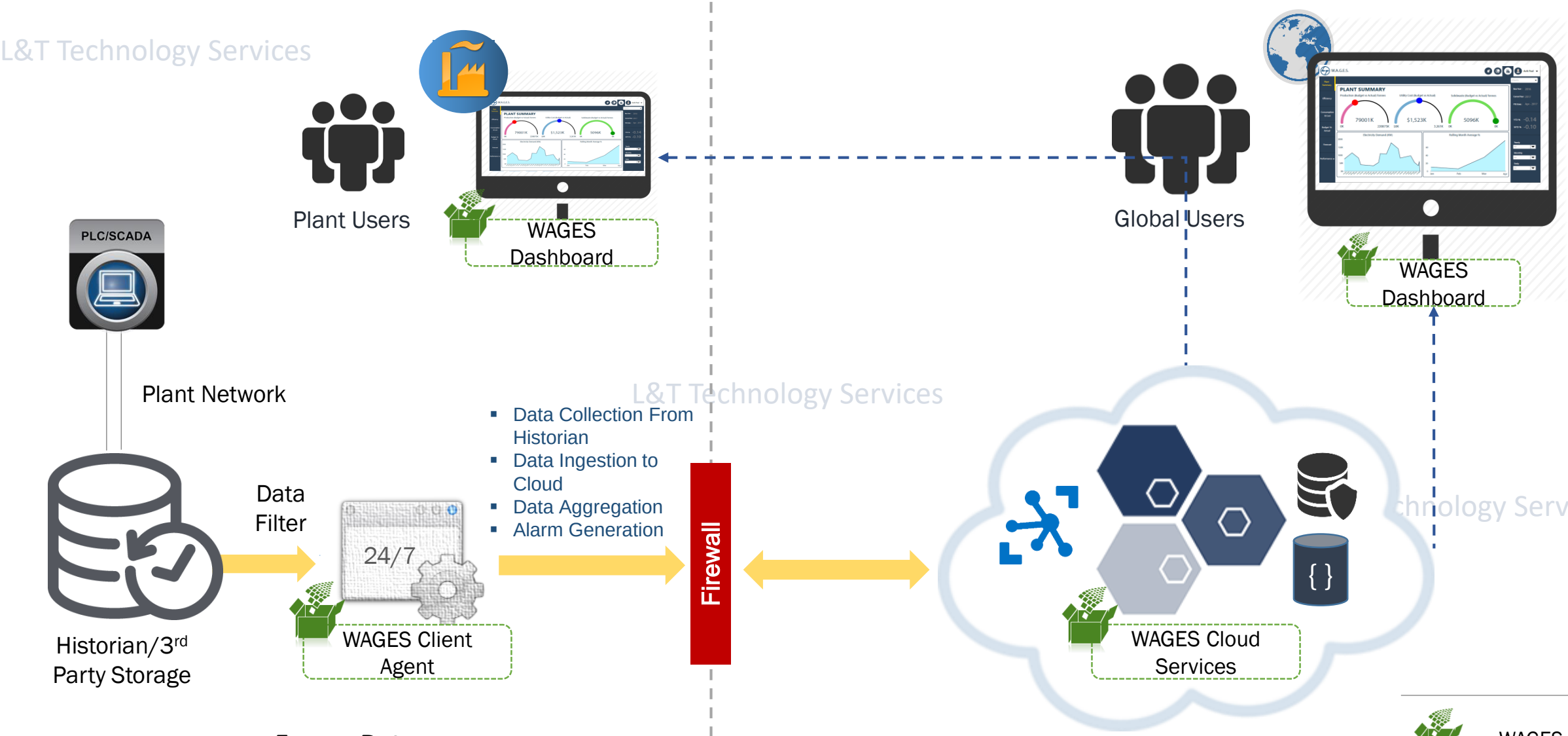
WAGES
L&T Technology Services

WAGES – Data Flow

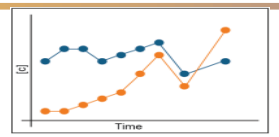


WAGES – Azure Architecture

Historian/3rd Party Storage

WAGES Client Agent

- Data Collection From Historian
- Data Ingestion to Cloud
- Data Aggregation
- Alarm Generation



Time Series Data

IOT Hub

Azure Functions

L&T Digital Core Microservices

WAGES App Service

WAGES Dashboard

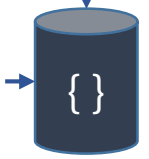
- Asset Configuration
- KPI/Reporting
- Comparison Reports
- User Management
- Plant Configuration

WAGES Backend App Services

Time Series Service

Asset Service

Authentication Service



Azure Table/Document DB

Azure Cosmos (Graph API)

Azure SQL

WAGES Package

Asset Modelling

Asset

- An asset can be anything that's of value to a customer that needs to be tracked and/or managed.
- An asset (or "asset instance") is simply the digital representation of the individual item that is being modeled
- Assets will also often be associated with other assets. This association in a structure can come in the form of a network of assets

Classification

- These are simply a modeling element used to group similar types of assets together based on a number of common characteristics.
- Classifications assist queries (like show me all boilers)

RID/Part Number

- Part Numbers provide design characteristics for an asset as defined by a company (typically the manufacturer)
- They often contain detailed information about an asset such as physical properties, expected performance metrics, and so on

Tags

- Tags are used to tie assets to an external source of information such as time series data.

Events

- Events are often used in conjunction with configuration changes made to an asset

States

- States are commonly used to describe the current condition of an Asset

Time Series API

Message

- MessageId - a unique number
- EpochInMS - UNIX epoch time in milliseconds. Unix Epoch is the number of seconds that have elapsed since January 1, 1970 (midnight UTC/GMT), not counting leap seconds (in ISO 8601: 1970-01-01T00:00:00Z).
- Quality - a number representing quality of the data
  - 0 Bad quality
  - 1 Uncertain quality
  - 2 Not applicable
  - 3 Good quality. If you do not specify quality, the default is Good (3).

Get Tags

Gets List of TAGs

Querying for Time Series data

- You can use the Time Series API in various ways to query for data points
- You can query data points using start time, end time, tag names, time range, measurement, and attributes

Time Series API

Query Properties

- **Start and End Time**: Your query must specify a start field, which can be either absolute (milliseconds) or relative (such as 1y-ago). The end field is optional, and can be either absolute or relative. If you do not specify the end time, the query uses the current date and time. *Above example* shows relative start time and absolute end time.
- **Limit:** When you create a query, you can specify a limit for the number of data points returned in the query results. *Above example* shows a query with the "limit" property set to 1000.
- **Order**: The default order for query results is ascending, and it is ordered by timestamp. You can use the order property in your query request to specify the order you want the data points returned. *Above example*returns the data points in descending order.
- **Aggregation**: Aggregation functions allow you to merge different data series into one single time series. Aggregation functions each perform distinct mathematical operations and are performed on all the data points included in the sampling period. *Above example* has an aggregation of type "avg."
- **Filters**: You can filter data points by attributes, qualities, and on multiple tag names using a set of comparision operators. *Above example* has a filter based on certain attributes.
- **Groups**: Use the groups option in queries to return data points in specified groups. You can group data points by attribute, quality, measurement, and time.