2015

Global Azure BOOTCAMP

Event Hubs: Million Events Per Second To The Cloud

The Microsoft Azure hyper scale ingestion

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WHO AM I ? CONTACTS

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"... constantly moving between the devices and the cloud ..."

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AGENDA

- Telemetry … the problem
- Microsoft Azure Service Bus …
  - Messaging … Queues & Topics … the offer
- Telemetry at scale … the BIG problem
- Microsoft Azure Service Bus … again …
  - Event Hubs … the solution
- Event Hubs :
  - Why ?
  - Architecture
  - Features
  - Against Queues & Topics
- Demo

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TELEMETRY … THE PROBLEM

- Information flowing from a device to other systems for conveying status of device and environment
- Unidirectional
- Data frequency can be different based on applications/conditions

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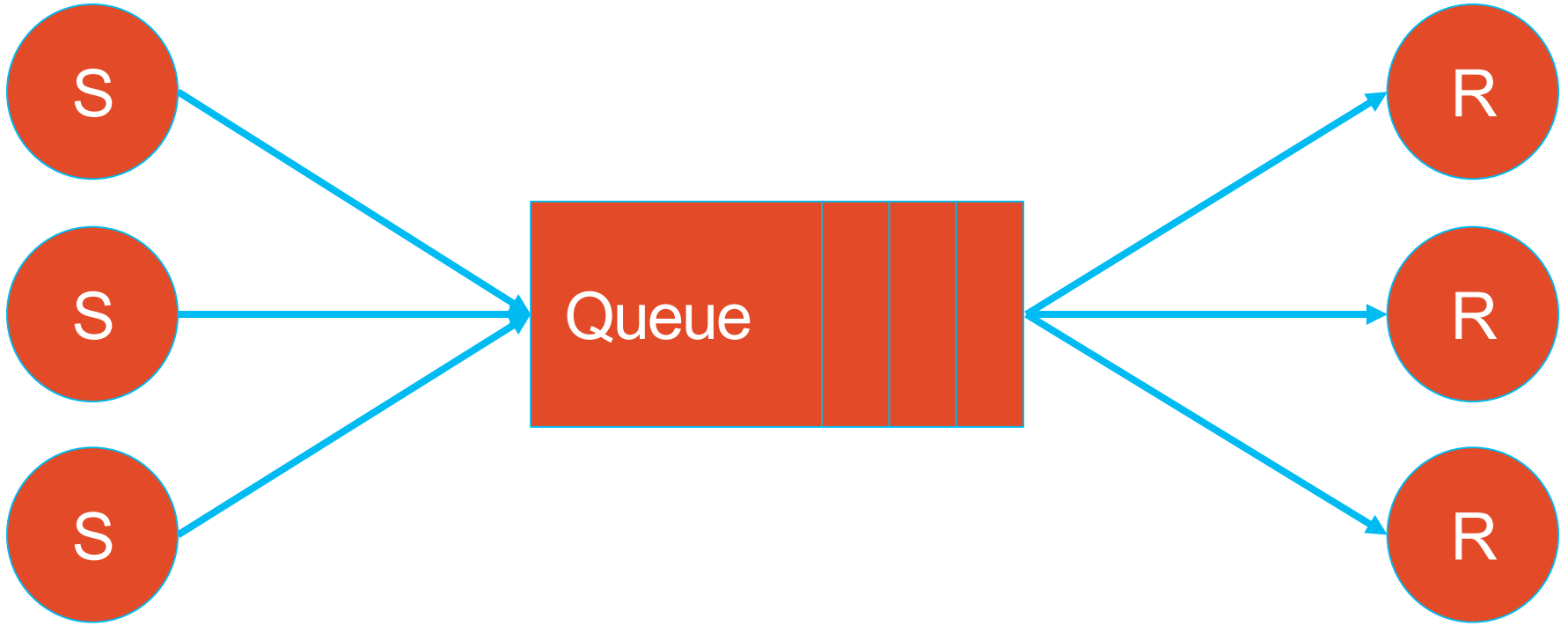
SERVICE BUS … QUEUES

- Competing Consumers pattern
  - all consumers read from same stream (queue)
- Message consumed by a single consumer



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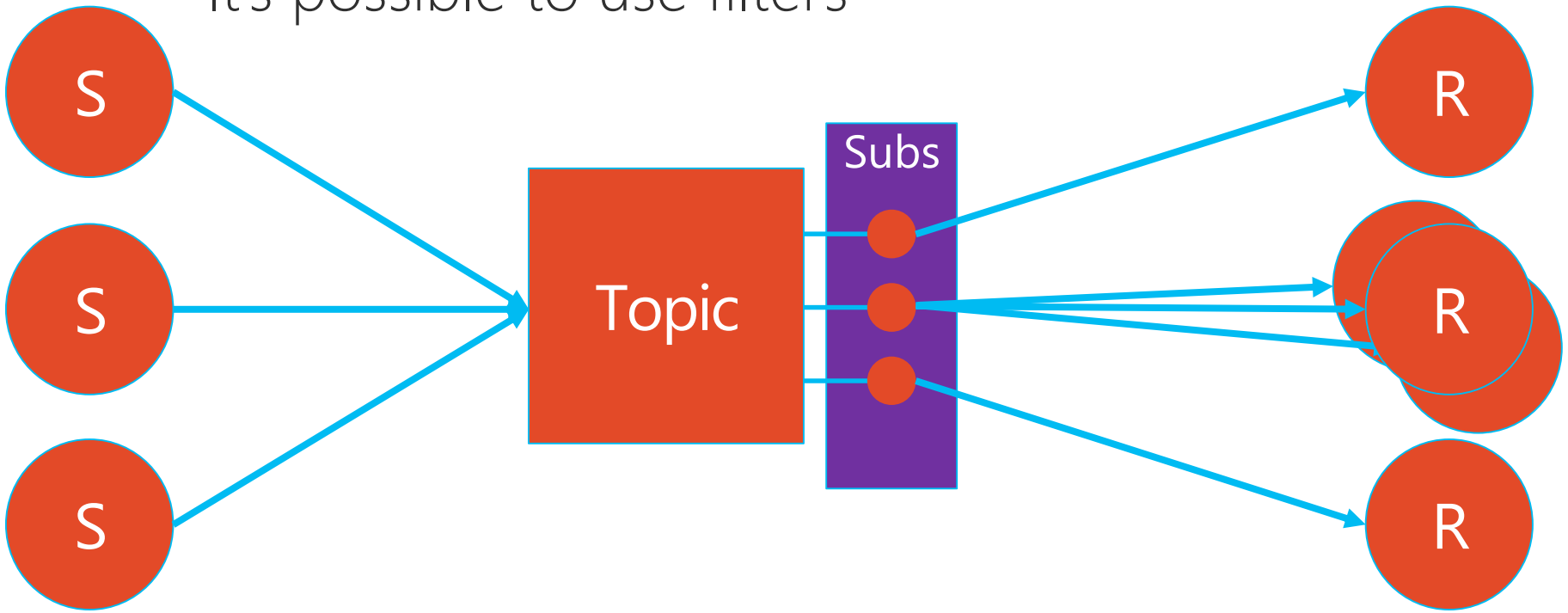
SERVICE BUS … TOPICS

- Publish/Subscribe pattern
  - each consumer reads from its subscription (a copy of message on related topic)
- Message consumed by more subscribers
  - It's possible to use filters



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SERVICE BUS: QUEUES & TOPICS

- Message are durably stored but with TTL
- Receive & Delete or Peek Lock
- Sessions (for FIFO feature)
- Request/Reply pattern (based on correlation)
- Transaction for batch send/receive
- Dead-letter queue (TTL or “poisoned” messages)

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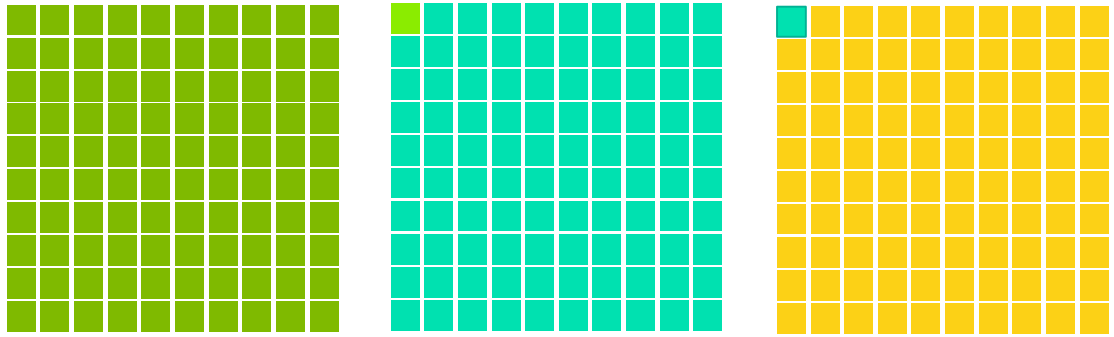
AT SCALE … THE BIG PROBLEM

- Hyper Scale
- Million clients
- Concurrent



100 10,000 1,000,000

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TELEMETRY … EXAMPLES

- Device Telemetry
  - Houses send telemetry every 10-15 minutes
  - Cars send telemetry every minute
- Application Telemetry
  - Performance counters are measured every second
  - Mobile applications capture every action
- Gaming online
  - Halo …1,000,000 messages/second

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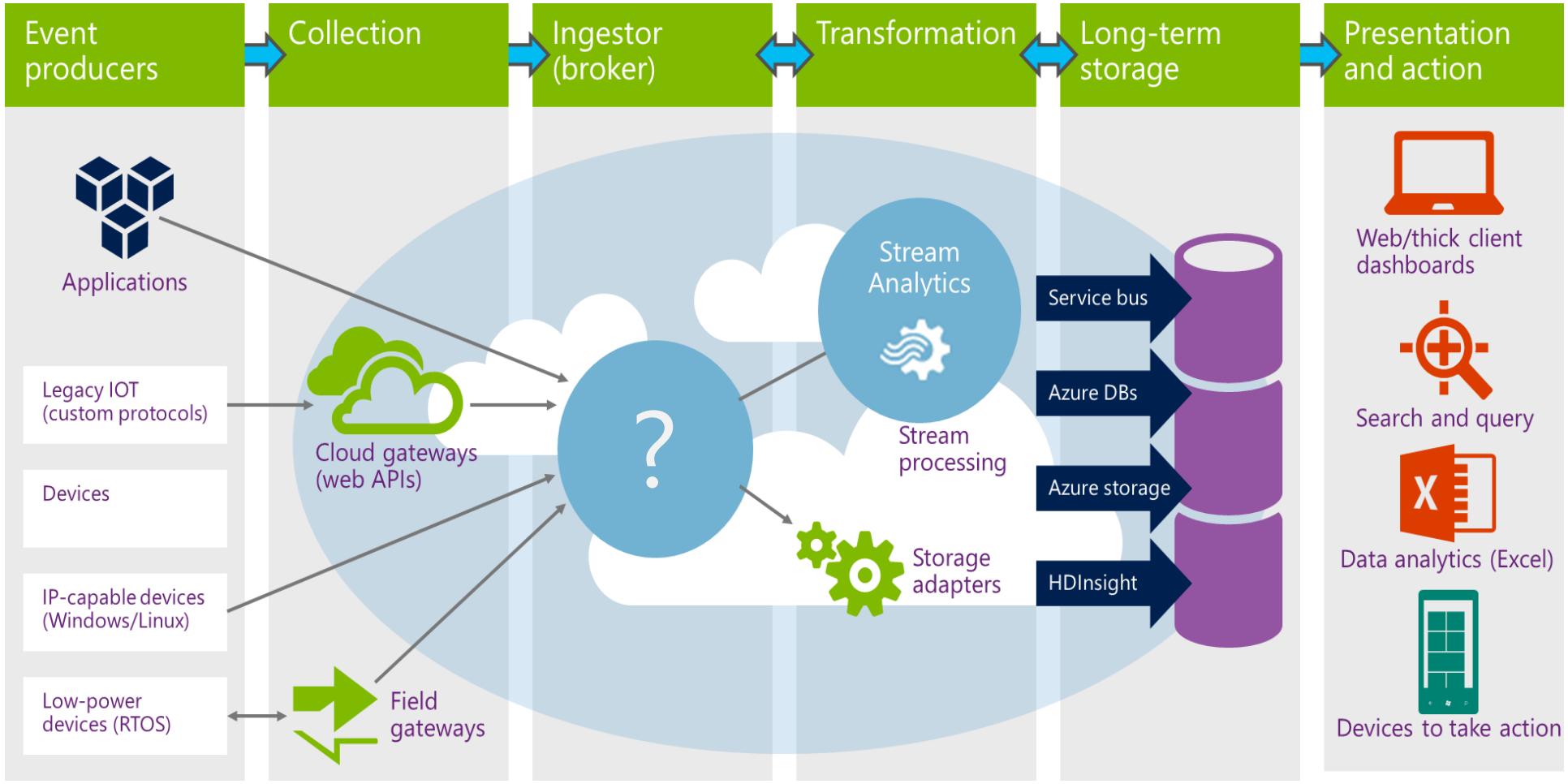
EVENT-DRIVEN SCENARIO



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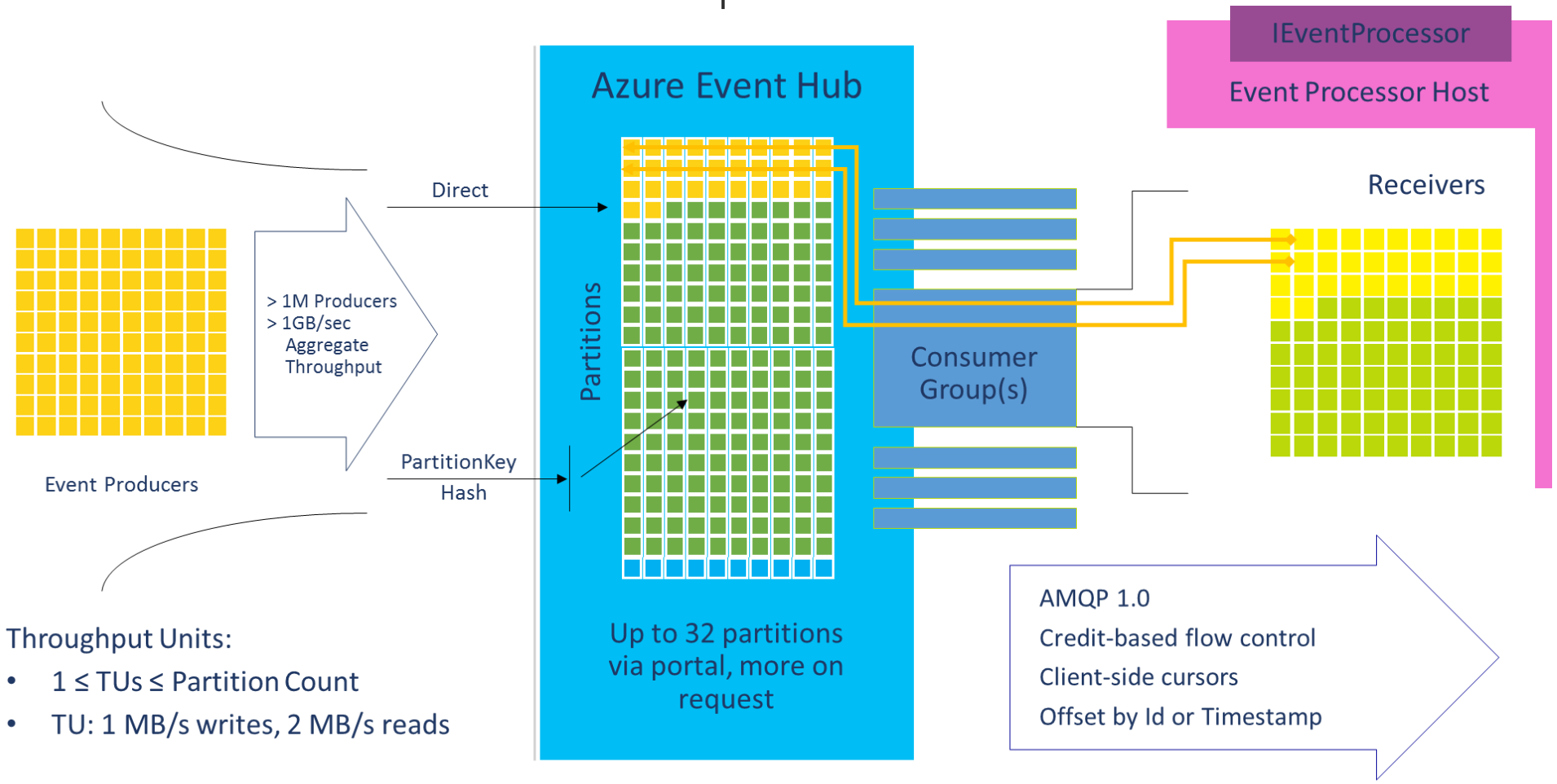
SERVICE BUS … EVENT HUBS

- Partitioned Consumers pattern



Throughput Units:

- 1 ≤ TUs ≤ Partition Count
- TU: 1 MB/s writes, 2 MB/s reads

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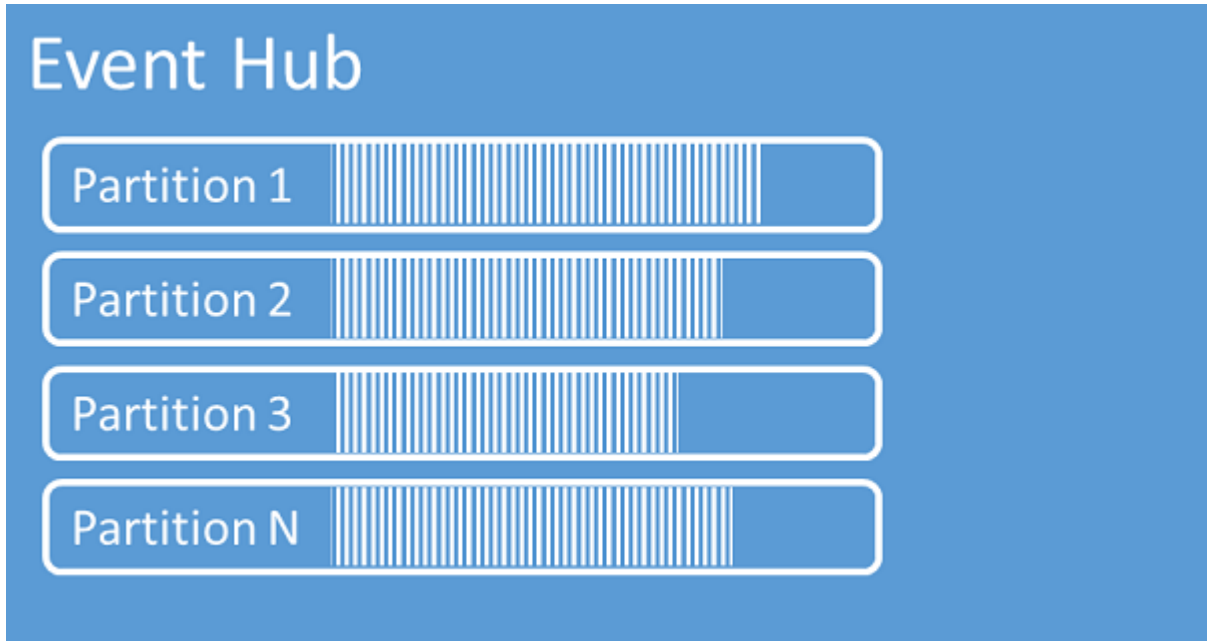
PARTITIONS

- Default 16 partitions, min 8, max 32
  - Azure Support can enable up to 1024 (it is a very special condition ! ☺)



- Event stream partitioned for scale-out
  - Consumers pull out events in parallel
  - Producers send events in parallel
- How producers use/address partitions
  - Directly with partition Id
  - Hash based using partition key or publisher identity
  - Automatic round robin distribution

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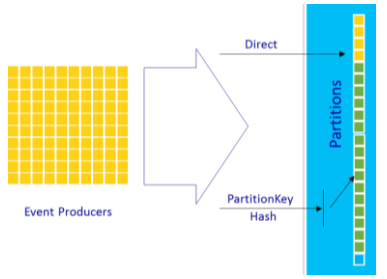
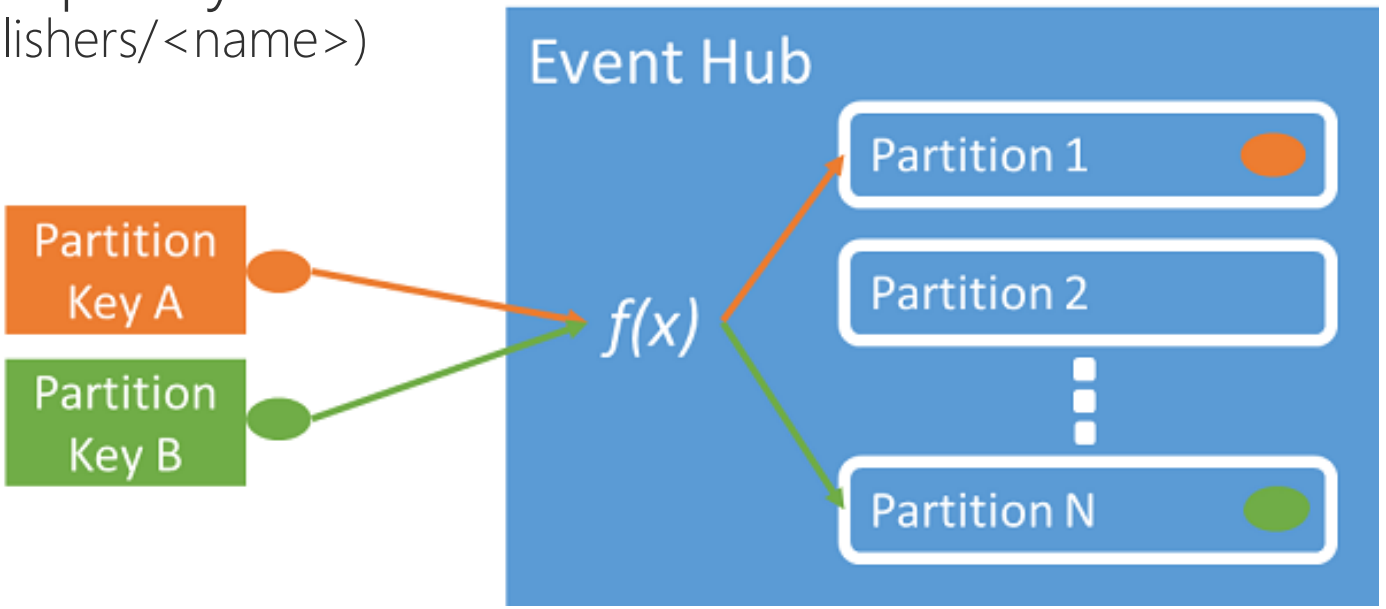
PUBLISHERS



- Publish in many ways …
  - No partition info (round robin)
  - Partition Id (directly)
  - Partition key hashed to select related partition
  - Publisher policy (<eh>/Publishers/<name>)
- Protocols supported
  - HTTP(S)
    - Short lived, low-throughput
  - AMQP(S)
    - Long lived, high-throughput



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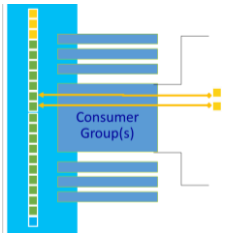
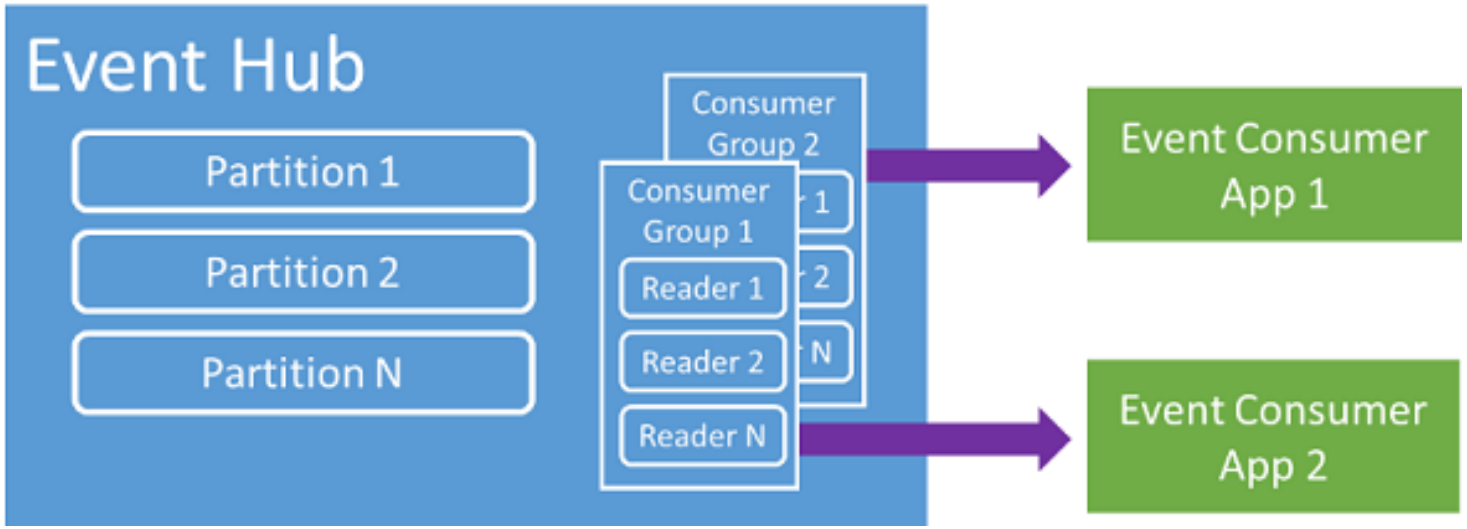
CONSUMER GROUPS



- Receivers are part of a Consumer Group
  - In general, a receiver per partition
- Consumer Groups are views on the stream
  - Similar to topic subscriptions
  - $Default consumer group
  - Up to 20 named consumer groups



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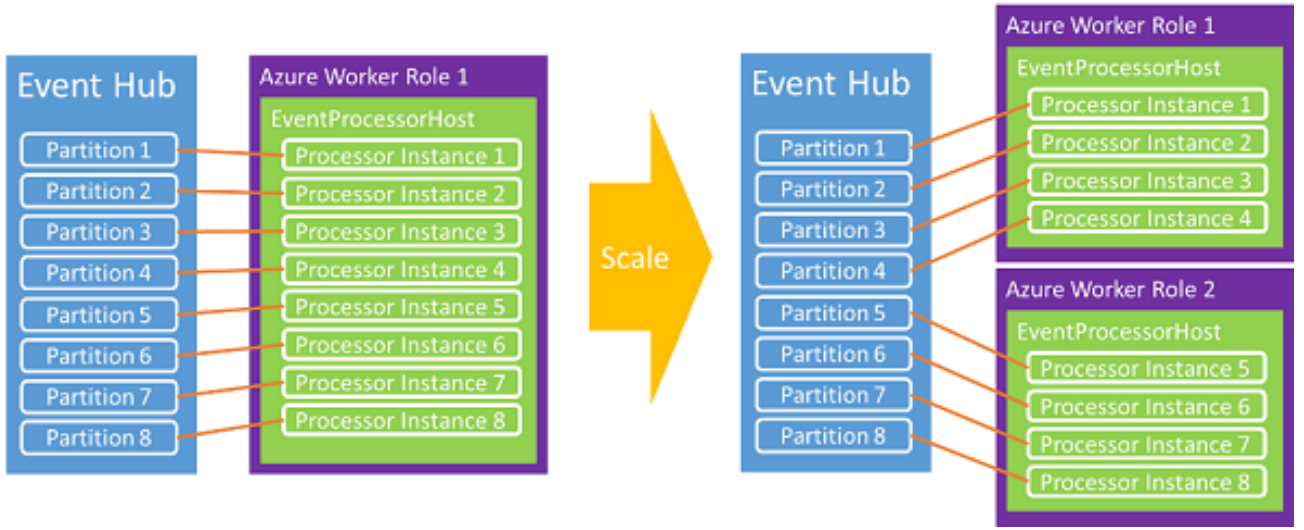
EVENT PROCESSOR

- .Net API abstraction for receivers (Nuget package)
- IEventProcessor
  - Interface to handle messages in batch
  - OpenAsync/ProcessEventsAsync/CloseAsync
  - Registration with a consumer group
- Lease
  - Each processor acquires a lease on a partition for failover and scale
- Checkpoint
  - Store (Azure Storage Blobs) a checkpoint with offset inside a stream



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THROUGHPUT UNITS

- Throughput Unit (TU)
  - Ingress : 1 MB/sec (or 1000 events/sec)
  - Egress : 2 MB/sec
  - Retention : 84 GB/day
  - Billing : hourly
- Number of partitions ≥ Throughput Units
  - One TU can handle more partitions
  - One TU for partition, better performance, high cost :-)
- Throughput Unit works at namespace level
  - It can handle more event hubs

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EVENT HUBS VS QUEUES&TOPICS

- Patterns
  - Q&T : useful for Command Message and Request/Replay Message (response queue)
  - EH : useful for Event Messages
- Cursor
  - Q&T : on server side. Message consumed and deleted from queue, cursor to next available message
  - EH : on client side. Client can rewind on the stream and re-read same events (during their retention). Access partition by offset or timestamp
- Retention
  - Q&T : TTL at queue/topic level or message level
  - EH : max 7 days

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EVENT HUBS VS QUEUES&TOPICS

- Security & Authentication
  - Q&T and EH
    - SSL/TLS via HTTP(S) or AMQP(S)
    - SAS (Secure Access Signature) for sending/receiving
  - EH
    - Publisher policy (SAS Token)
    - Fine grained per device
    - Revoke/Restore publisher
- Other
  - EH doesn't have dead lettering, transaction, … to have higher throughput

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EVENT HUBS : PRICING

Basic: Up to 100 connections, no extension Standard: 1000 connections incl.	**Price (US Dollars)**	
Throughput Unit Hour (Basic)	0.015/0.03	TU per hour (Basic/Standard)
Ingress Events	0.028	per 1,000,000 events
Cost Brokered Connections (0 -1k)	0	Included (Basic/100, Standard/1k)
Cost Brokered Connections (1k-100k)	0.00004	connection/hour
Cost Brokered Connections (100k-500k)	0.00003	connection/hour
Cost Brokered Connections (500k+)	0.00002	connection/hour
Storage Overage >TUs*84GB		local-redundant Azure storage charge-through

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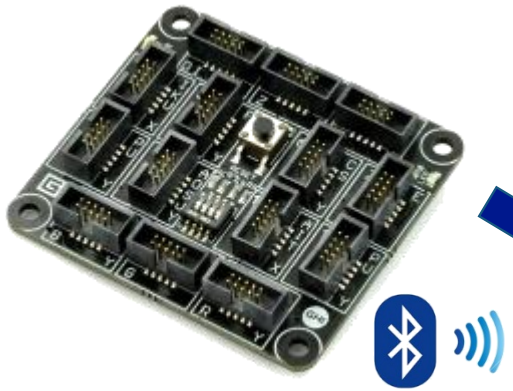
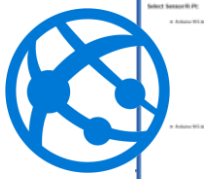
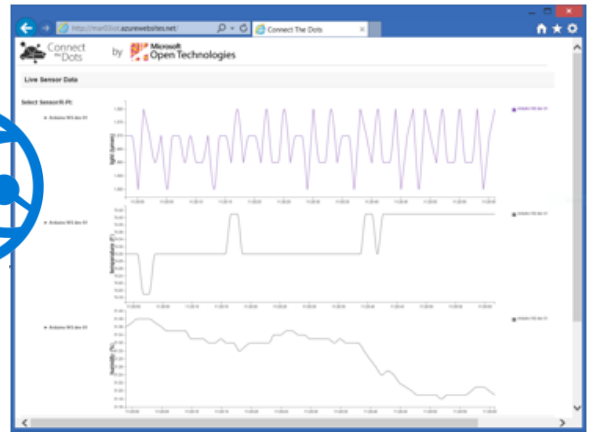
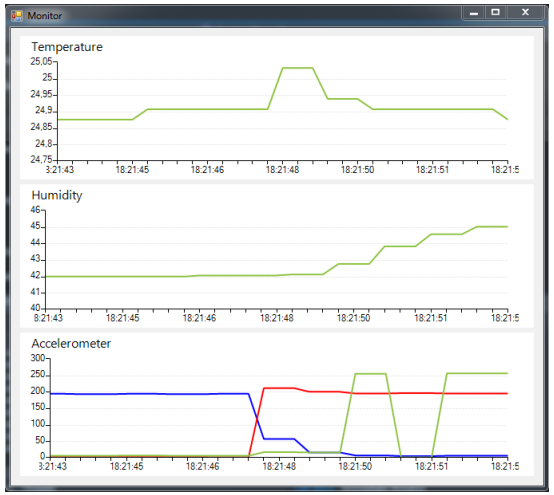
BLE → IOT GATEWAY → CLOUD



Connect the Dots







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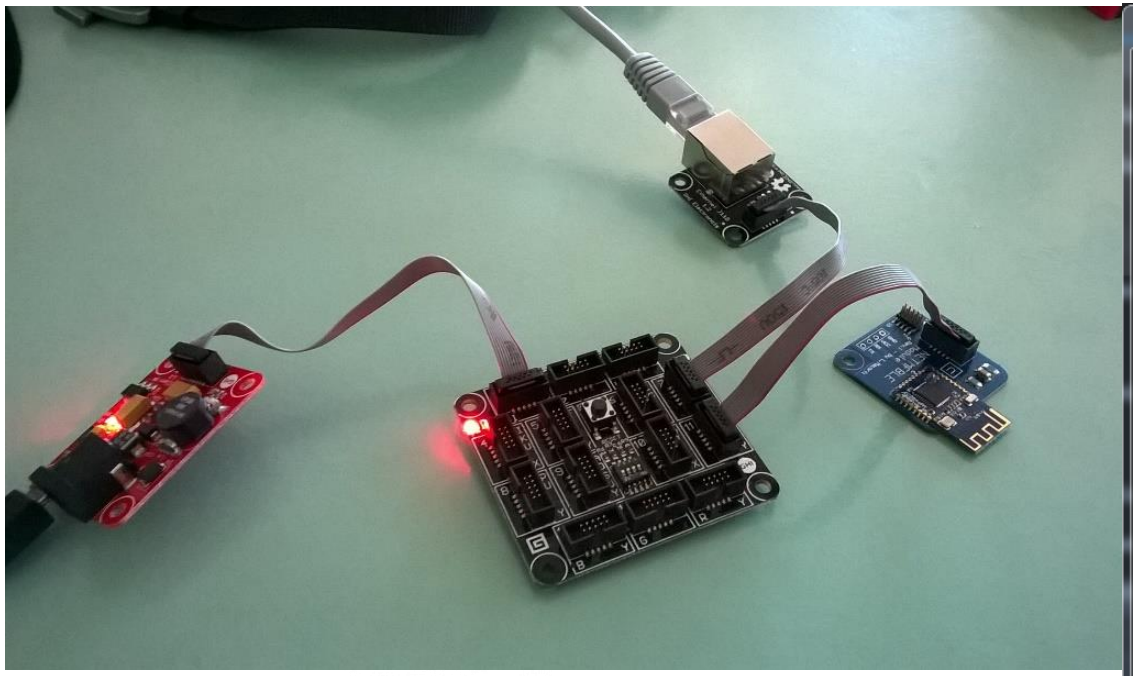

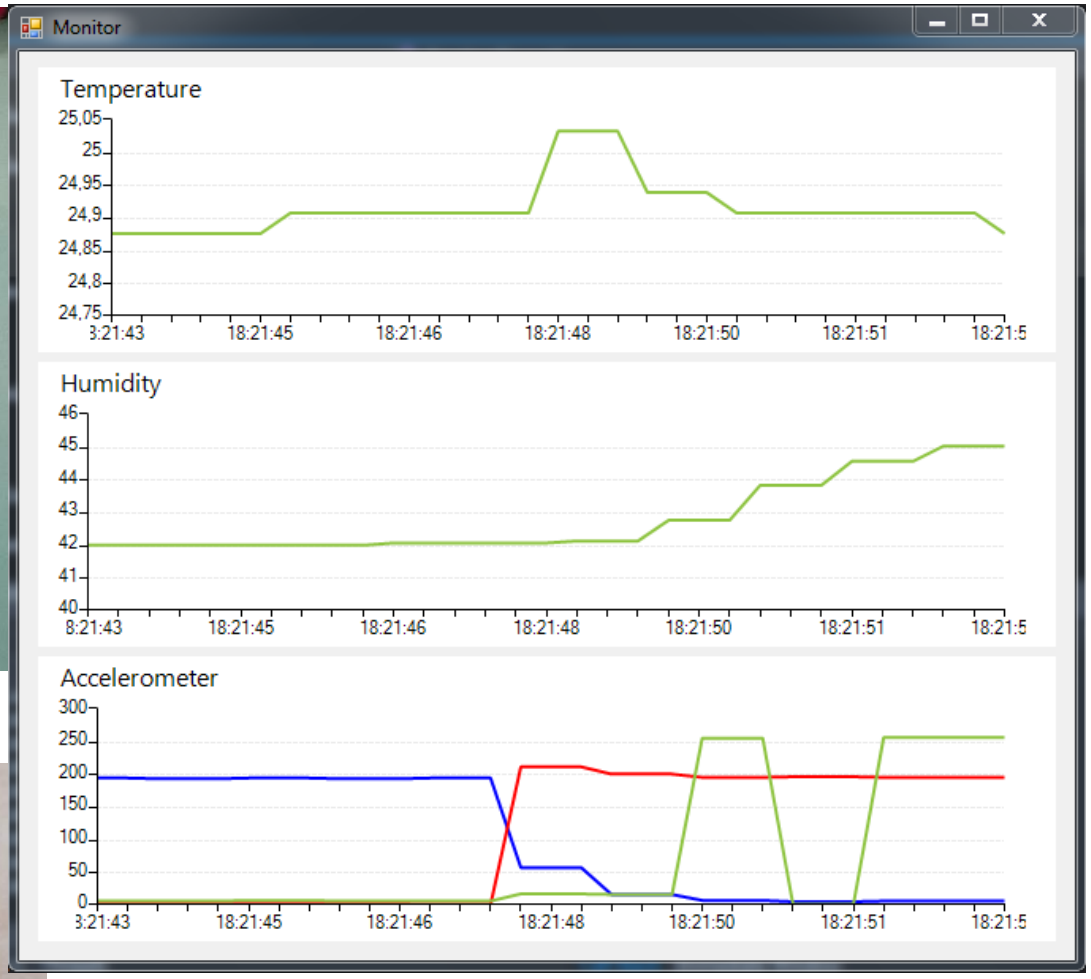

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BLE IoT Gateway → Event Hubs

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  - BLE for Net MF : https://netmfble.codeplex.com/
  - Embedded101 : http://www.embedded101.com

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