The Great Debate: Scale Out vs Scale Up: Is it either, or ... or both?

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A CONTRARIAN TIME

"We’re bottled-necked on SSD performance!

A NO-SQL FIRM WITH IN-MEMORY FOCUS

V U C A

VOLATILITY | UNCERTAINTY | COMPLEXITY | AMBIGUITY
CONTINUOUS DEPLOYMENT
QUALITY
OPERATIONS

DEVELOPMENT

535 deployments per month
6419 deployments per year
196 people deploy to production

SOURCE: ETSY’s 2012 DevOps statistics reported at SXSW
SCALE-OUT, SCALE-UP DEFINED

- **Scale-out**: 
  - Shared everything
  - Consistent
  - Perfect data
  - $10^s$ of nodes

- **Scale-up**: 
  - Shared nothing
  - Eventually consistent
  - Data variance
  - $\geq 100^s$ of nodes
NO VARIANCE WITH A PROBABILITY OF 1 FOR CONCLUSION

THINK: BANK ACCOUNT BALANCES, FINANCIAL TRADES, COMPONENT FAILURES ON CRITICAL INFRASTRUCTURES, OR ESSENTIALLY ANYTHING WITH RISK AND REGULATION

VARIANCE WITH A PROBABILITY LESS THAN 1 FOR CONCLUSION

THINK: SENTIMENT ANALYSIS, PREDICTIVE MAINTENANCE, PROCESS CONTROLS OR ANYTHING WHERE DECISIONS CAN BE MADE WITH SOME DEGREE OF RISK TOLERANCE
SCALE-OUT, SCALE-UP A CAGE MATCH

WINNER?
SCALE-OUT, SCALE-UP ON THE SAME…

EAM!
PUTTING IT ALL TOGETHER

① Acquire packet data to discern indicators of packet loss and persist
② Lookup customer name, ID, etc. from HANA in real-time
③ Spin up Hadoop to compute sentiment on Twitter data by customer
④ Combine all data to try and correlate packet behaviors with sentiment
PUTTING IT ALL TOGETHER

1. Acquire packet data to discern indicators of packet loss and persist
2. Lookup customer name, ID, etc. from HANA in real-time
3. Spin up Hadoop to compute sentiment on Twitter data by customer
4. Combine all data to try and correlate packet behaviors with sentiment

LATENCY LEADS TO POOR QUALITY
AGUMENT WITH EDGE SCALE-IN

1. Spin up packet acquisition & WAN-ACC engines on the edge
2. Load the relevant models and queries
3. Decommission packet acquisition in the core
IN-MEMORY COMPUTE PRESSURES NETWORKS

IMPLICATION: NEW (STORAGE) ARCHITECTURES ARE REQUIRED

FABRIC

FABRICS (e.g. PCIe, IB) LEAD SERIAL NETWORK RATES

NETWORK

GigaBYTES/sec  [UNIT: 8 bits]  ≥  GigaBITS/sec  [UNIT: 1 bit]

THROUGHPUT

0.1’s MICROseconds  [ORDER: 0.0000001s]  ≥  10’s MICROseconds  [ORDER: 0.00001s]
INTERNET OF THINGS

(IN 2020 ACCORDING TO CISCO)
### IS IN-MEMORY COMPUTE WAN COMPATIBLE?

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<thead>
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<th>TRADEoffs</th>
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<tr>
<td>real-time OR latency</td>
<td>10 Gbps leased line</td>
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<tr>
<td>connectivity OR cost</td>
<td>$50k-$70k month</td>
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<tr>
<td>reliability OR bandwidth</td>
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<td>private OR unsecured</td>
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Transition to Multi-Modal Architectures

Applications and sources at real-time and near real-time focus that are latency intolerant

Capacity optimized persistence and data lakes with embedded analytics
Transition to Multi-Modal Architectures

Applications and sources at real-time and near real-time focus that are latency intolerant.

Capacity optimized persistence and data lakes with embedded analytics.

ECU
- PROCESSING: 4000 MIPS (64bit)
- MEMORY: 0.5 GB
- STORAGE: 8 GB
- I/O & SENSORS: 1 GigE | ACCELEROMETER | …
Transition to Multi-Modal Architectures

Applications and sources at real-time and near real-time focus that are latency intolerant

Capacity optimized persistence and data lakes with embedded analytics

Scale-in (to the edge): stream, filtering/winnowing, control systems, small edge applications

Storage (memory) control
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