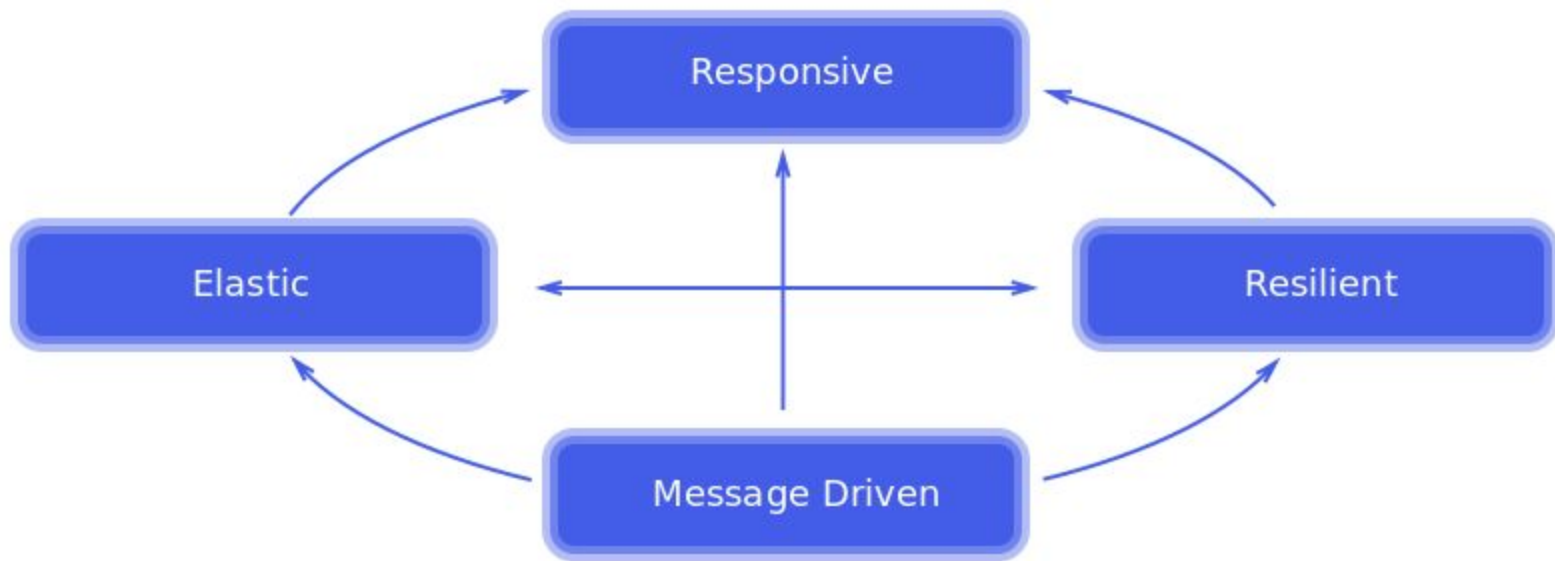


Adventures with APIs in Financial Trading

Michael Barker (@mikeb2701)
LMAX Exchange

?

Software Performance



“Amazon's calculated that a page load slowdown of just one second could cost it \$1.6 billion in sales each year.”

<https://www.fastcompany.com/1825005/how-one-second-could-cost-amazon-16-billion-sales>

“...slowing down the search results page by 100 to 400 milliseconds has a measurable impact on the number of searches per user of -0.2% to -0.6%...”

Google Research - <https://research.googleblog.com/2009/06/speed-matters.html>

“I reduce my latency by 0.3s and
customers spend an extra £8m/yr”

Mark Holt - CTO thetrainline.com
<https://www.youtube.com/watch?v=ai-6qwT6ES8>

OPRA 2016 Q2
Peak msg/s: 11.3m
Peak msg/100ms: 2.2m

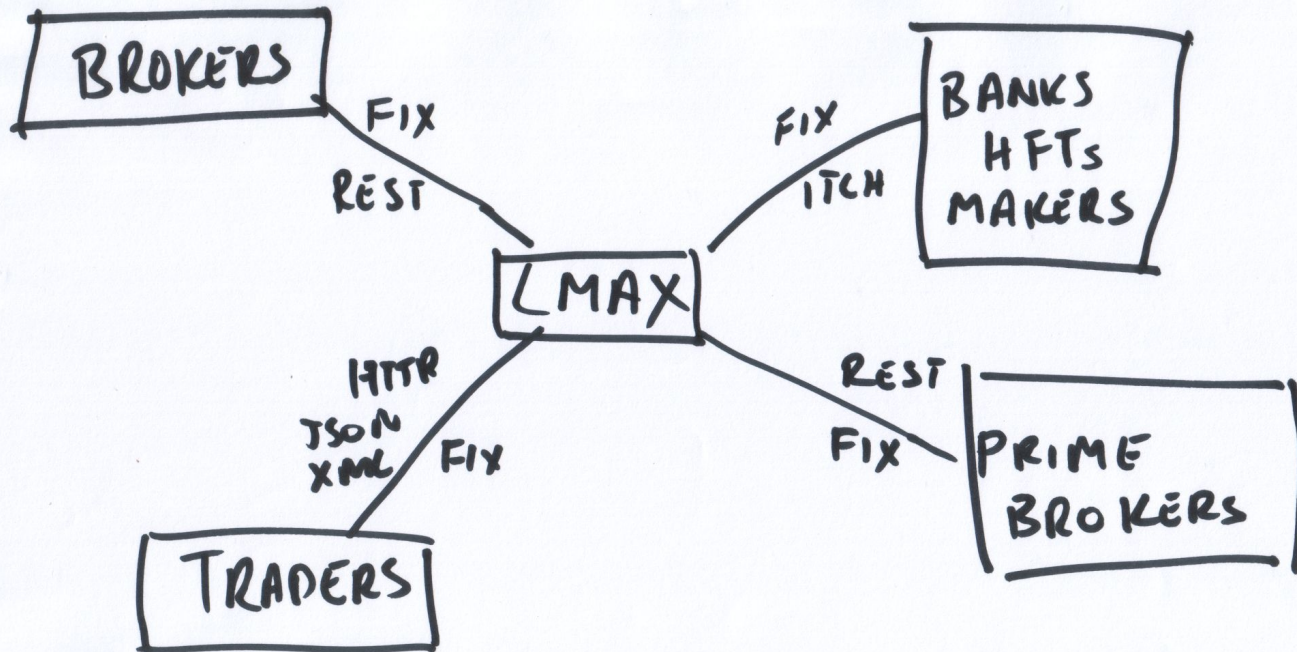
https://www.opradata.com/pdf/opra_sip_metrics.pdf

LMAX Exchange

Mean Latency: 80 μ s

99%'tile Latency: 130 μ s

@15,000 tx/sec



FIX

ITCH



The OSI reference model consists of seven layers that build from the wire (Physical) to the software (Application).

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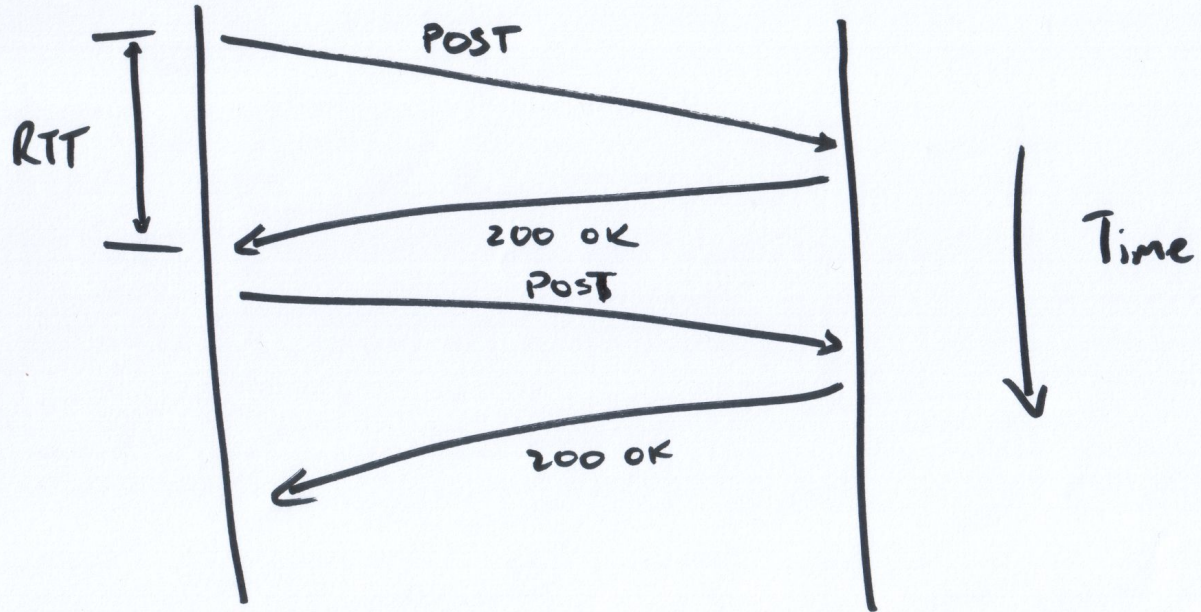
8=FIX.4.1 | 9=112 | 35=0 | 49=BRKR | . . .

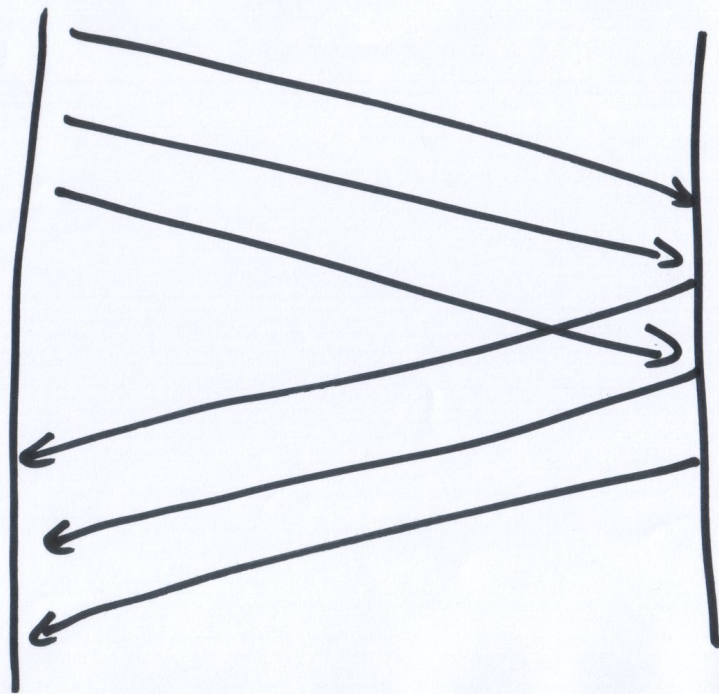
56=INVMGR | 34=235 | . . .

52=19980604-07:58:28 | . . .

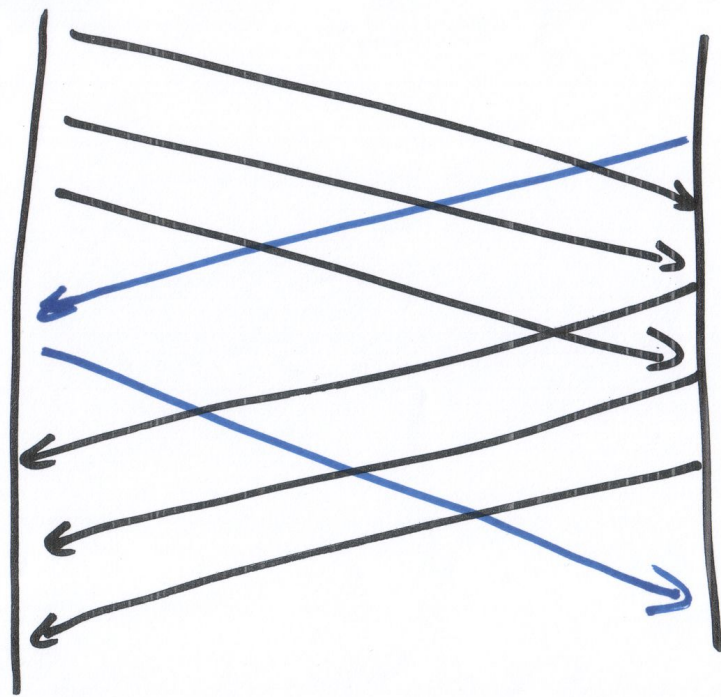
112=19980604-07:58:28 | 10=157 |

HTTP




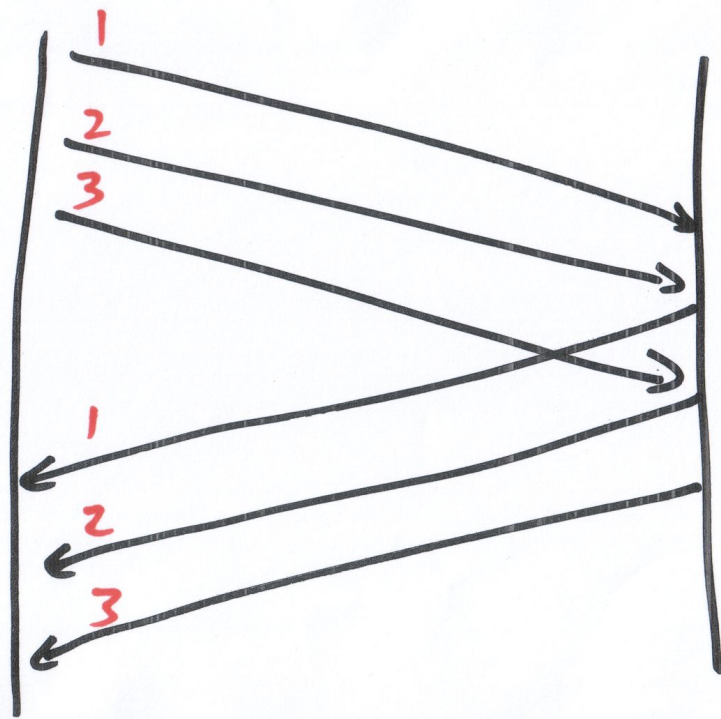


Time
↓



Time





Time

8=FIX.4.4|9=148|35=D|34=2|...

49=account1nm7lc9qzfh3b|...

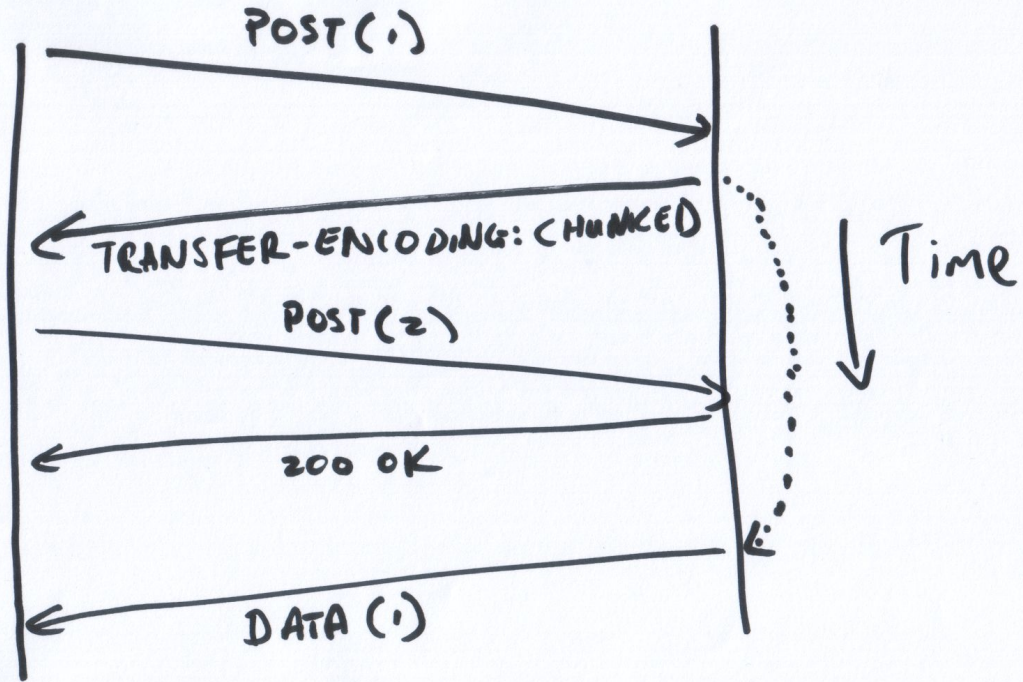
52=20160929-10:40:36.287|56=LMXBL|...

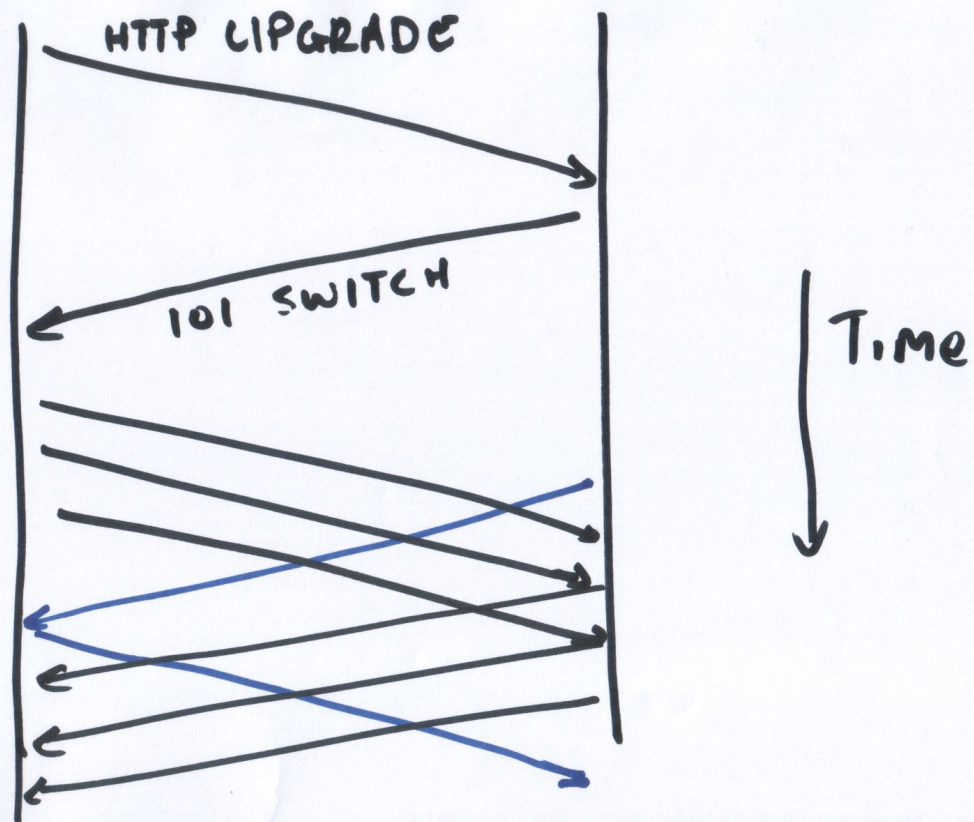
11=ordermE4"hZol&]kbFY|22=8|38=10|40=1|...

48=180513|54=2|59=3|60=20160929-10:40:36|...

10=218|

HTTP STREAMING





Poor Layer Separation

8=FIX.4.2 | 9=106 | 35=A | . . .

95=8 | 96=password | 98=0 | 108=120 | . . .

141=Y | 10=239 |

Market Data

ORDERS

<u>BID</u>	<u>ASK</u>
9@15	7@18*
10@15	10@20
12@12	11@20

ORDERS

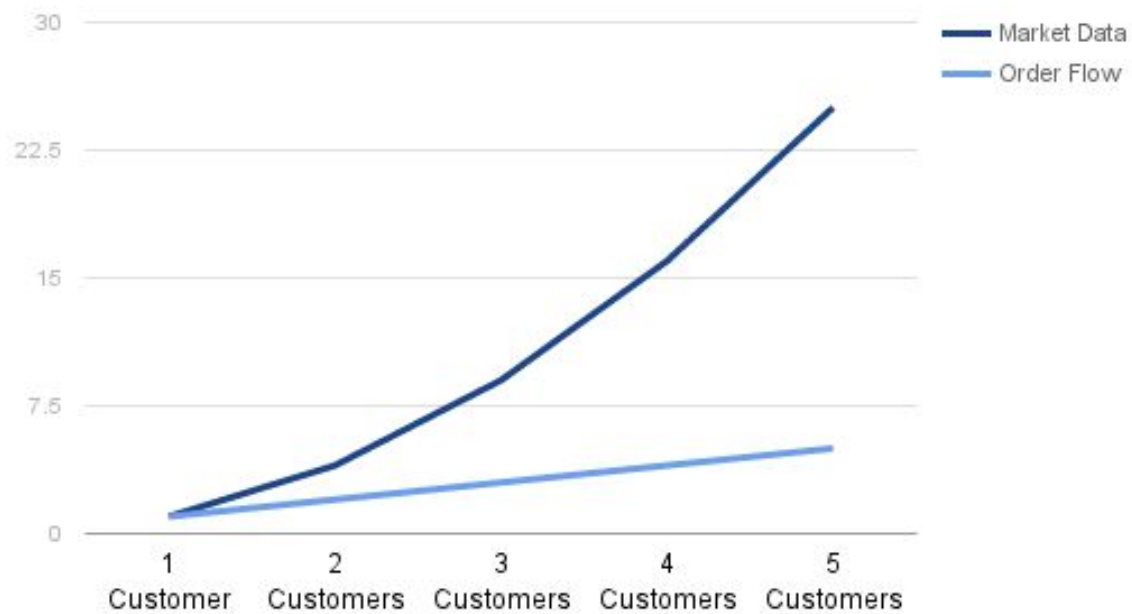
<u>BID</u>	<u>ASK</u>

SNAPSHOT

<u>BID</u>	<u>ASK</u>
9@15	8@19*
10@15	10@20
12@12	11@20

CANCEL 8@19
ADD 7@18

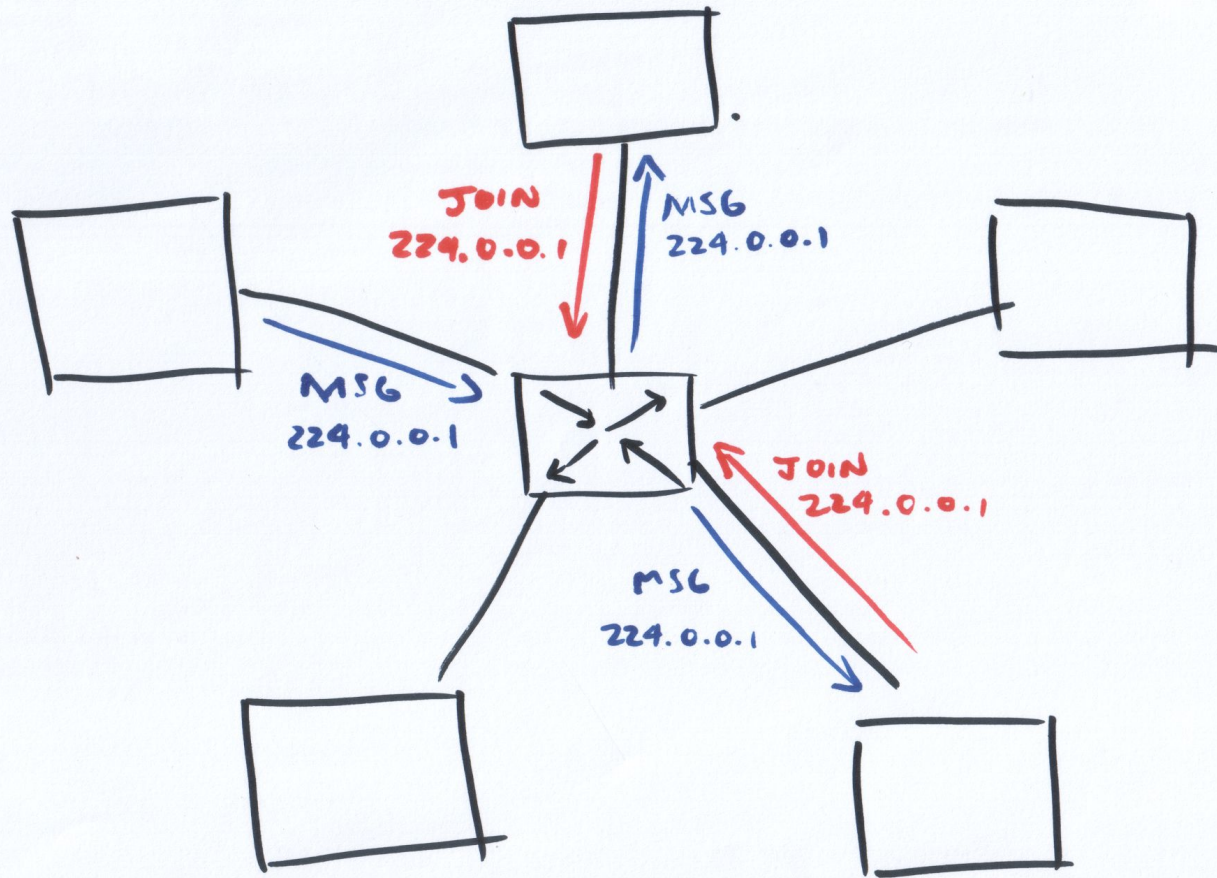
Messages/Sec





The OSI reference model consists of seven layers that build from the wire (Physical) to the software (Application).

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Reliable UDP?

Security through **anonymity**
and physical **locality**

The future?

Conclusion

- Challenging problems require a “from first principles” approach
- Ensure solutions are a fit to the problem
 - Even if the defacto standard is the most appropriate choice

We're hiring

<http://www.imax.com/careers>