

# Developing a Reliable Messaging System for an Unreliable and Diverse World

Rob Terpilowski  
Lynden, Inc.



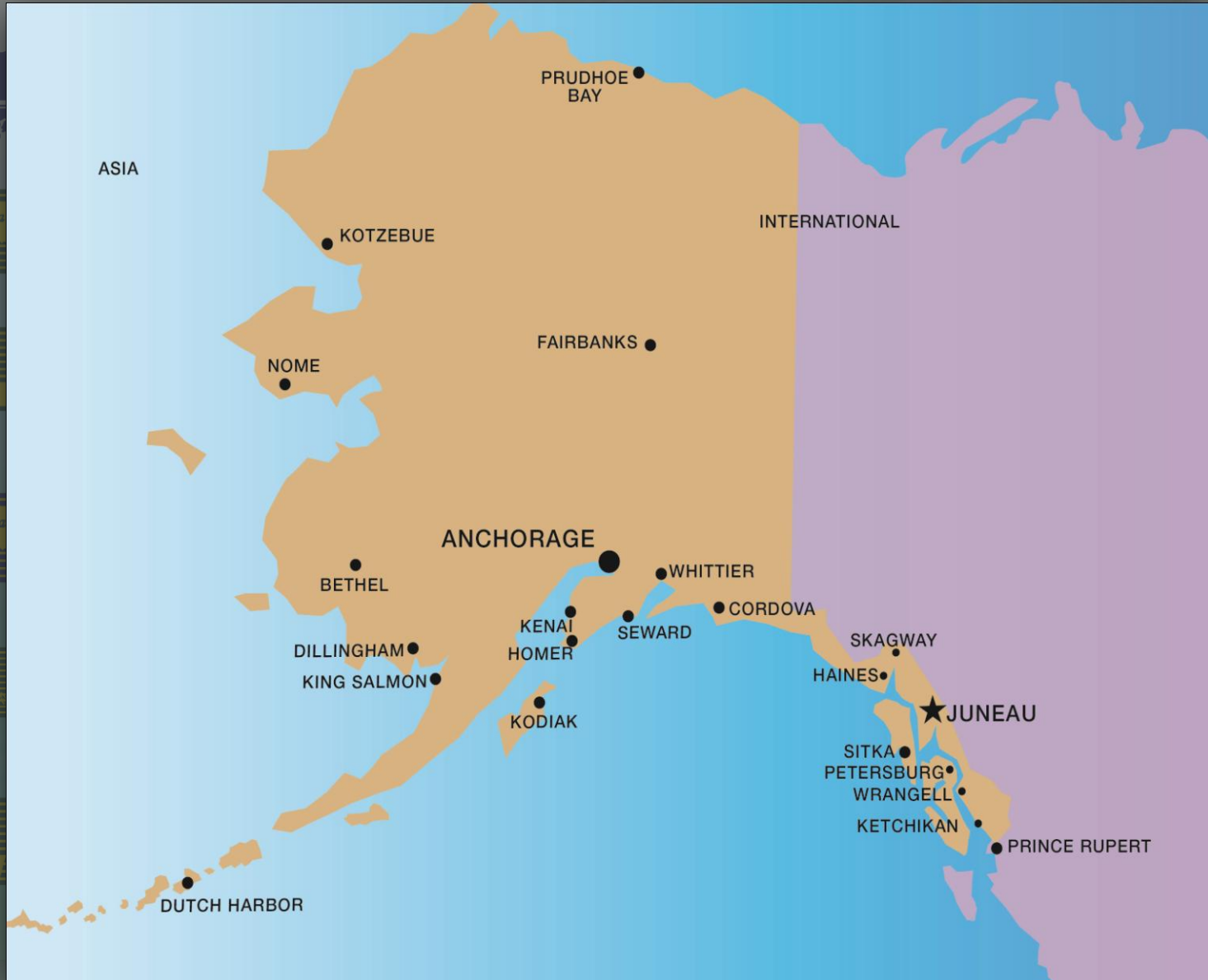
- Background on myself and Lynden
- Problem we are attempting to solve.
- Previous System
- Architecting a New System
- Results & Future Directions

I.T. just started beta testing our new software system. Beta must be greek for "Still doesn't work."



your  cards  
someecards.com

- Application Architect at Lynden, Inc.
- Technical lead for our freight tracking project, “Cross Dock”



## **LYNDEN AIR FREIGHT**



- Consolidates Freight
- Buys space on airlines
- Don't own their own equipment



- **Truck Service to Alaska from the Lower 48.**
- **Oil, Gas, Mining, and Seafood industries**
- **Own their own assets (trucks, trailers)**

## **ALASKA MARINE LINES**



- **Scheduled barge service from Seattle to S.E. Alaska**
- **Auto Dealers, Costco, US Postal Service**



# **L** LYNDEN

## **L** LYNDEN AIR CARGO



- **Scheduled Alaska Service**
- **Charter Service Worldwide**
- **Lockheed L382 Hercules Aircraft**

The Lynden Family of Companies



# The Problem

Where's my freight???



LoadedTruck.com

# The Problem

Major Customer of Lynden Air Freight required “piece level” tracking of their freight.



# The Story of ~~Shiptrac~~



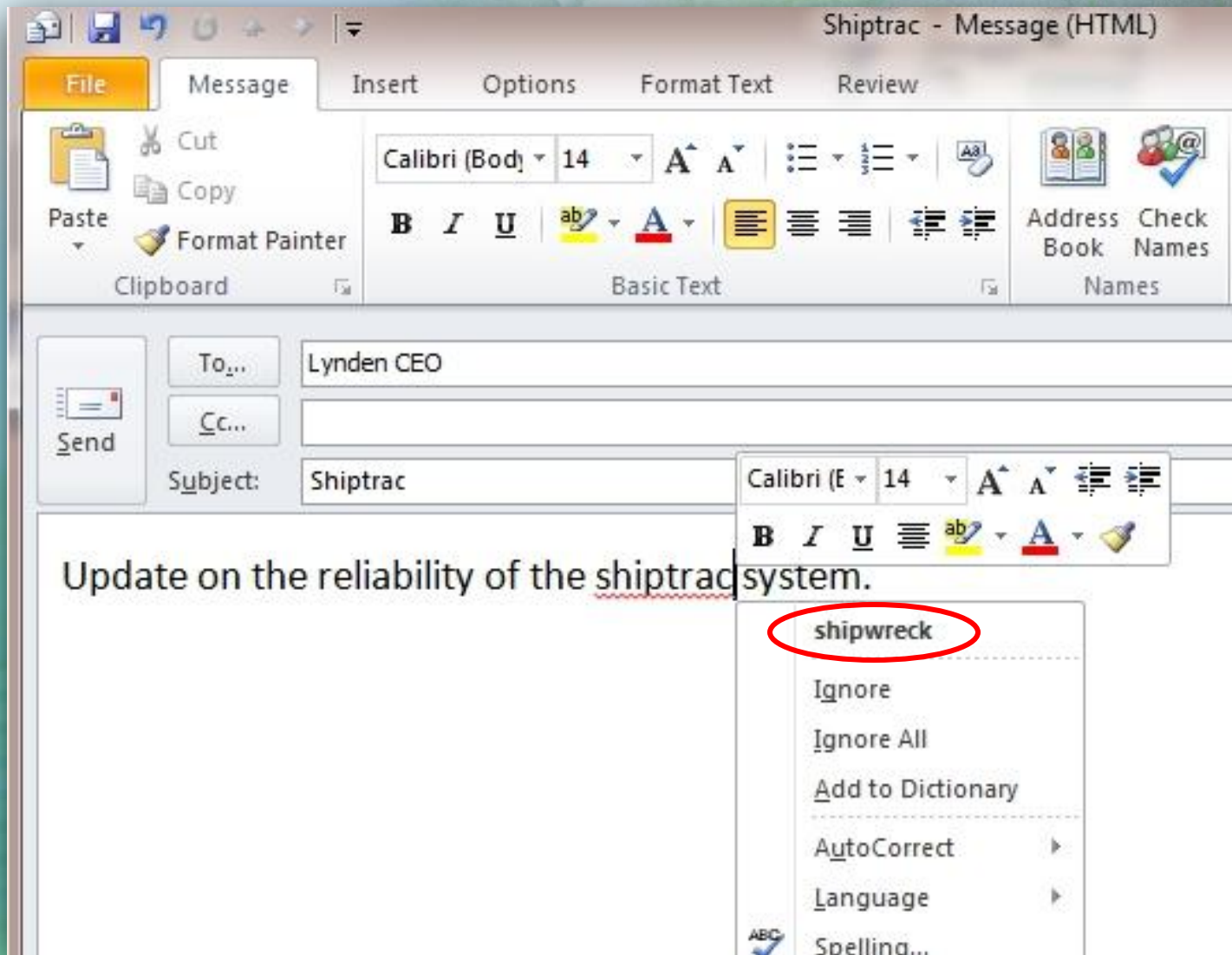
## MISTAKES

IT COULD BE THAT THE PURPOSE OF YOUR LIFE IS  
ONLY TO SERVE AS A WARNING TO OTHERS.

# The Story of Shiptrac

- Specifically designed for Lynden International
- Encountered major reliability issues
- Was becoming increasingly expensive to maintain
- Became known internally as “Shipwreck”.





- Stable
- Maintainable
- Scalable
- Extensible
  - Lynden International
  - Lynden Transport
  - Lynden Air Cargo
  - Alaska Marine Lines

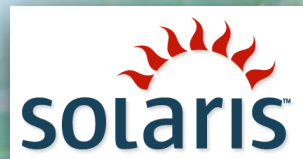
```

wIntegrate, LI KISKA, Open
File Edit Setup Run Help
DICT PM 14:15:06 05-08-12 Page 2
Type &
Field..... Field. Field..... Conversion.. Column..... Output Depth &
Name..... Number Definition... Code..... Heading..... Format Assoc..
BILL.DATE      0    2          D2.          DATE          8R    S
BILL.DATE.I    0    2          D2.          DATE          4R    S
BILLED.DATE    0    2          D2.          DATE          8R    S
DATE           0    2          D2.          DATE          8R    S
DATE.REC       0    2          D2-         DATE          8R    S
              RECEIVED
DATE.RECEIVED  0    2          D2-         DATE          8R    S
              RECEIVED
DATE.RECVD     0    2          D2-         RECD         8R    S
              DATE
DAY.OF.WEEK    0    2          DWA         DAY OF        9R    S
              WEEK
FF2            0    2          D2.          SHIP          4R    S
JE505.SHIP.DAT 0    2          D2.          SHIP          8R    S
E
MMDD           0    2          D0/MO       DATE          5R    S
Press any key to continue...
Ready          Ln 23, Col 28          CAP NUM
  
```



## Server Infrastructure

- Solaris 10



## Glassfish v3 Application Server



- Web Applications
- Web Services
- RMI Services

## Rich Clients

Carrier Bill Entry

File Edit Jump To Help

LATO.3993.2278 (C) LATO.3993.2279 (C) LATO.3993.2280 (C)

**Bill Information (FORWARD AIR INC.)**

Carrier Code: LATO Bill Number: 3993.2280  
 Product/Mode: Domestic Responsible Station: SEA  
 Service Level: TRK LTL AA Pier/Terminal:

**Container**

Routing Container Cgsts Comments Status

Barcode	Type	Container Num
C41740457	LOOSE	LOOSE

**Container Details**

Shipments

Shipment #	Org	Dest
4813791	SEA	ROC
TOTAL		

PCS: 3 Gross: 866.0 LB Chrg: 866.0 LB Dim: 454.00 LB Vol: 65.7 cuFt

wIntegrate, LI KAYAK, Open

File Edit Setup Run Help

LAF.U.HAWB Lynden Air Freight Housebill Entry 05/07/12

Batch  Init  Stn  Div 0 Type  Master

HAWB	Org	Rev	Dst	Date	Pcs	Wgt	PC02
Svc	DDT	Auth		Exc			
Shpr		Cons		Bill			
							Desc
							Cntrl By
							Customer Ref#s

Dims: Ln x Wd x Ht x Pcs Wgt Factor 166 Apply Dim Weight? Y  
 Density Tot Dim  
 Volume cf Chgable  
 Volume 0 cm Total Chgs

Charges: Code	Description	Value	Rate	Charge	PC0

Alert Comments

Ready Ln 2, Col 7 CAP NUM

## Windows CE Devices



**Motorola MC9090**



**Motorola VC5090**

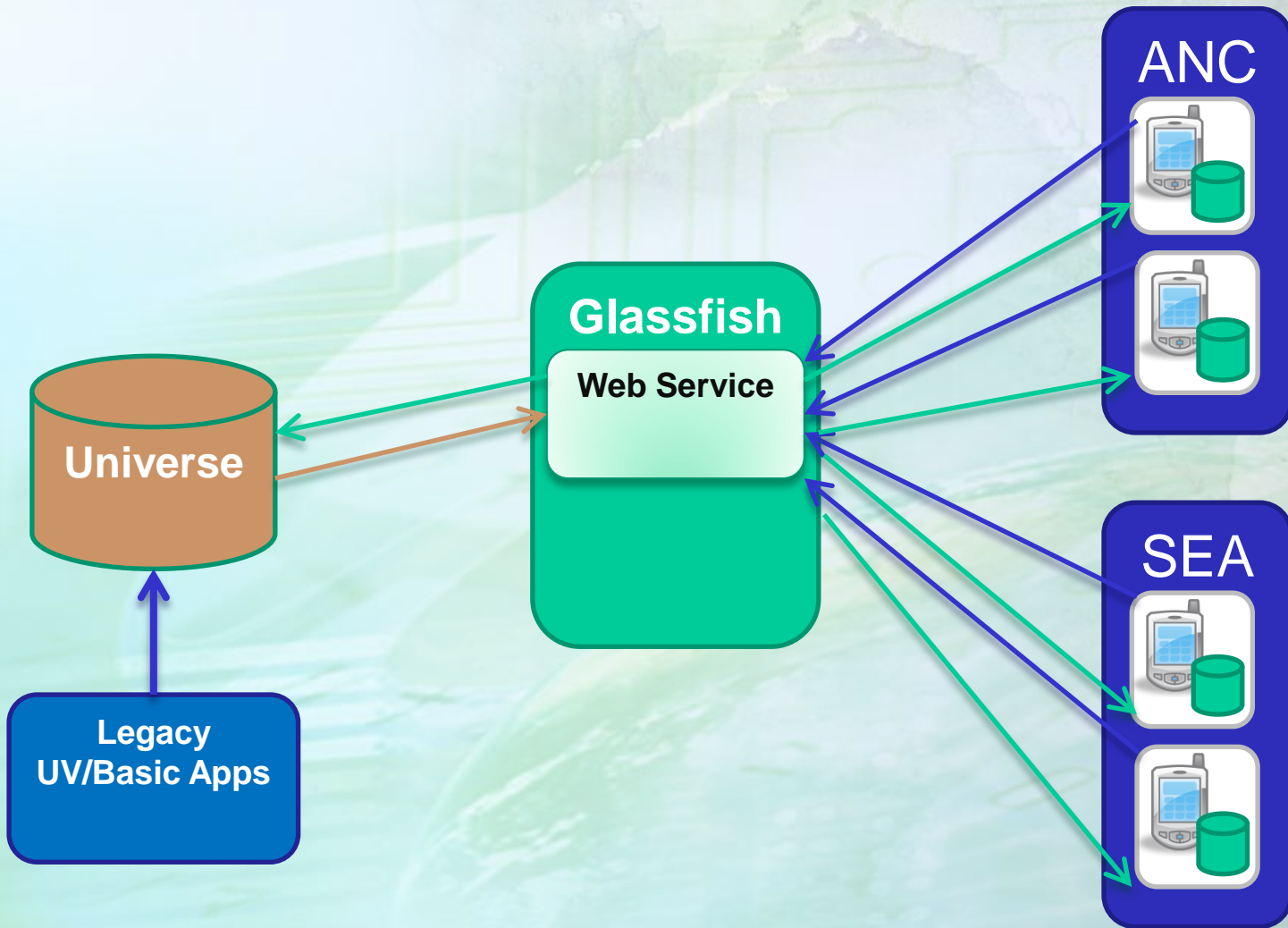


**Motorola WT4090**

I'm running the unit tests in my mind.




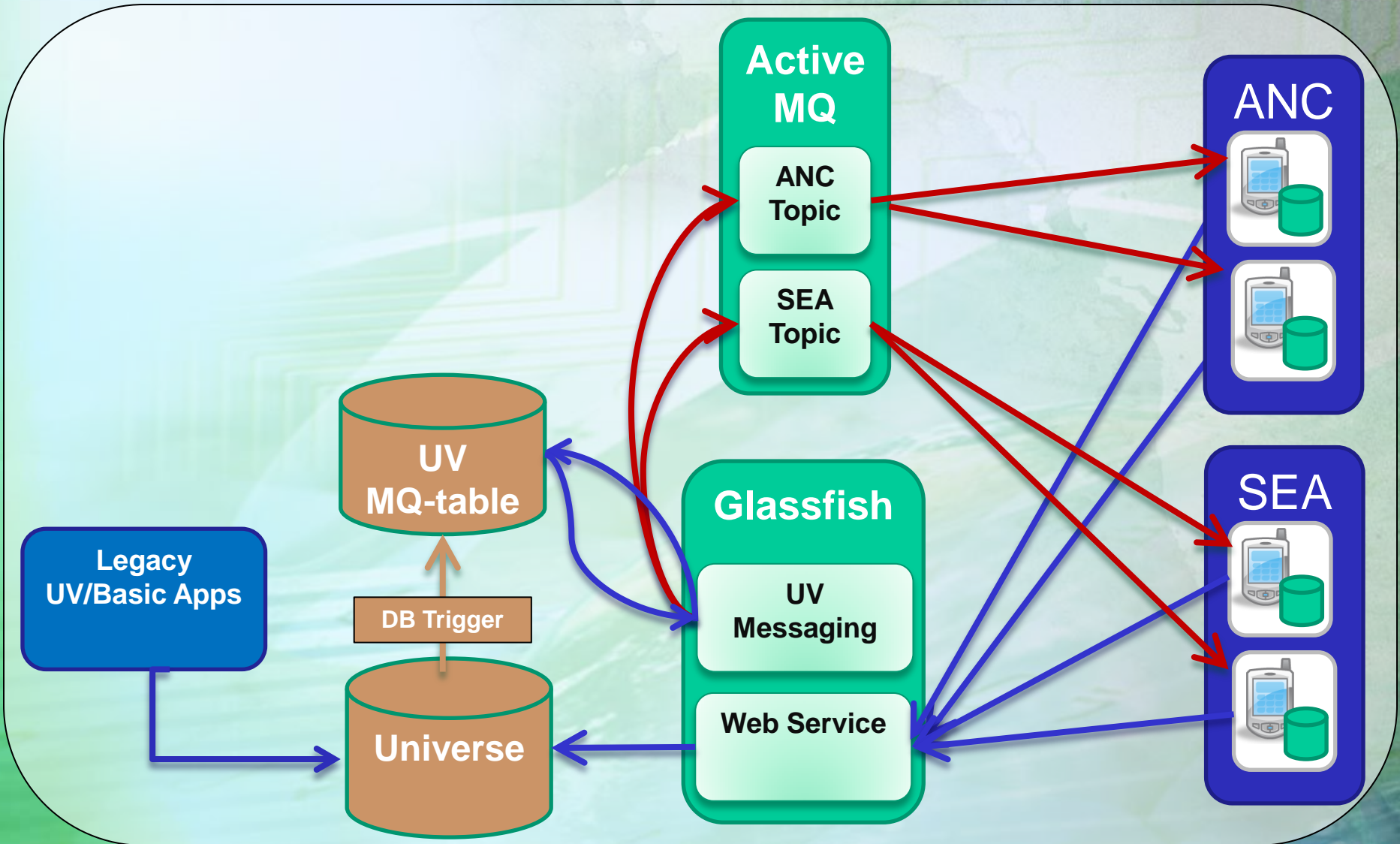
your  cards  
someecards.com



## 2 Major Issues

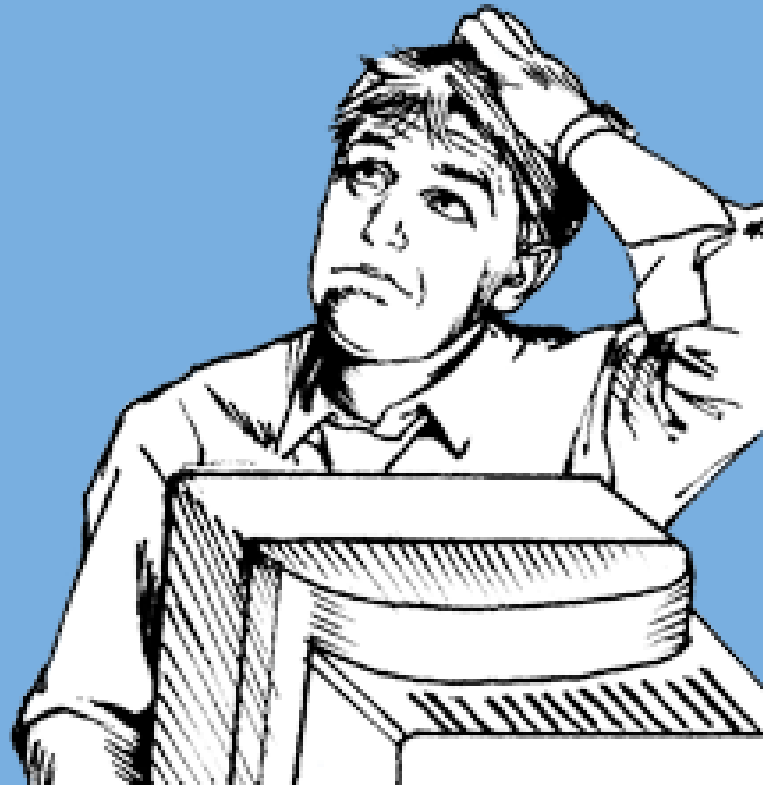
- Load on the database grew.
- Devices were getting data they didn't care about.

- Devices should only get data they care about
  - 1 Topic per location
- UniVerse DB and apps need to push messages.
  - DB trigger to write data to a UV file.
- The Bathroom problem 
  - Subscriptions needed to be durable





I thought the 7-layer model referred to a burrito.



your  cards  
someecards.com

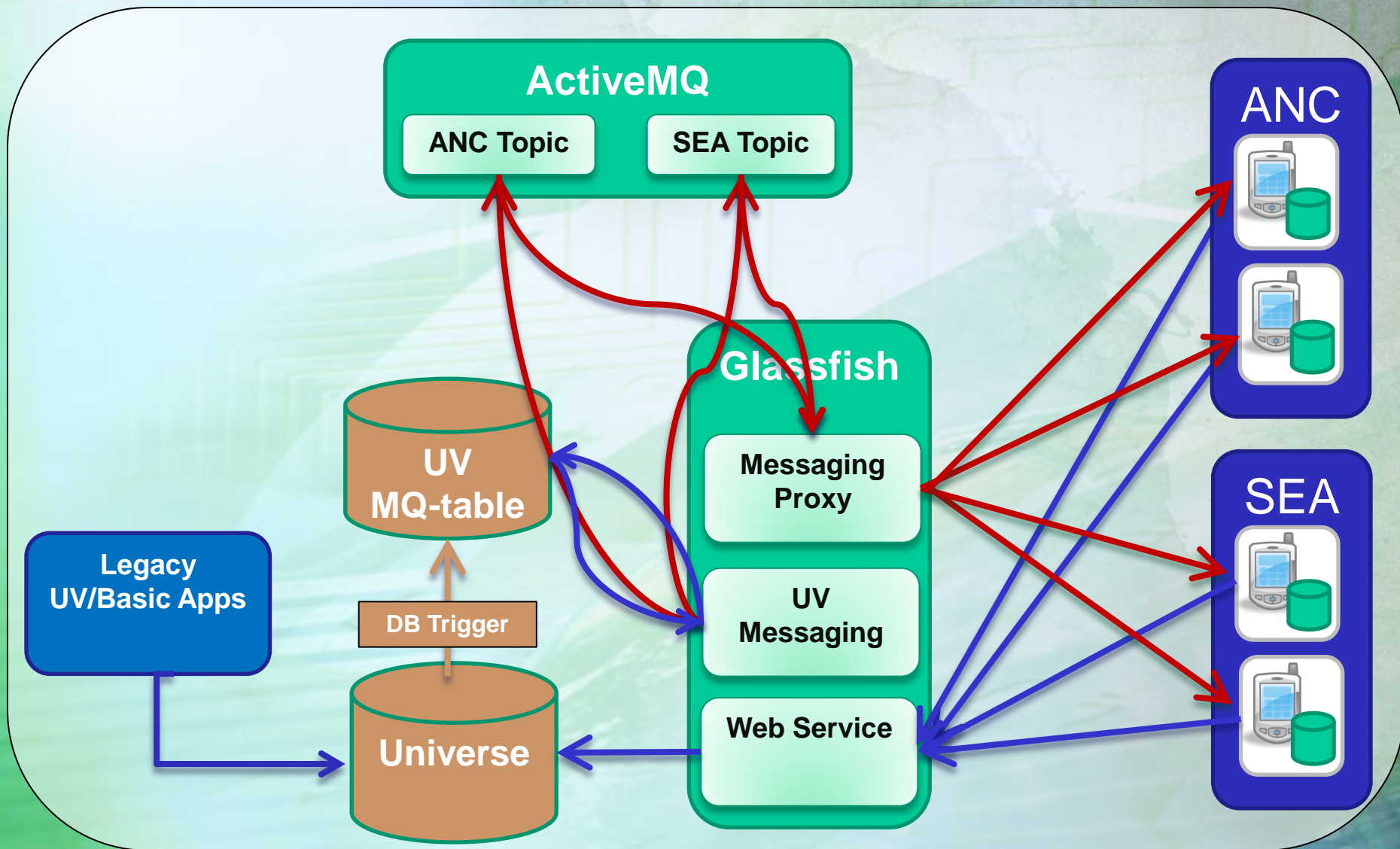
Not Quite...

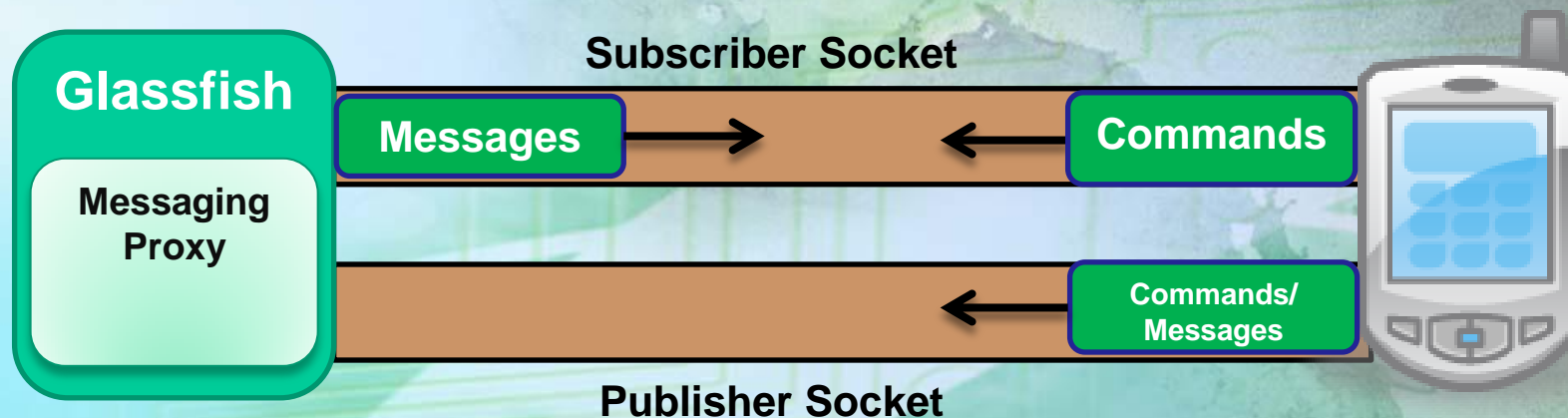
- .Net OpenWire implementation of failover transport was flakey on Win CE.
- Next version of .Net OpenWire client library (NMS) was dropping support for Win CE.

- STOMP
  - Performance Issues
- REST API
  - No support for durable subscriptions
- MSMQ Bridge
  - MSMQ support for Win Mobile, but not CE
- Roll our own proxy server

- Buffers broker from frequent client disconnects
- ASCII protocol
  - Can develop clients for our other platforms (UV/Basic, Java desktop)
  - Developed using Apache Mina libraries
- JMX Monitoring

# Messaging Proxy Server





## Proxy Commands

- Info
- Client
- Subscribe
- Start
- Ack
- Stop
- Unsubscribe
- Quit

```
C:\Windows\system32\cmd.exe
###CONNECTED;GUID:connectSubscriberGUID;VERSION:1.1.3-SNAPSHOT;Build-Date:2012-04-06 12:51

client MyClientId 222
###OK;GUID:222

subscribe /com/lynden/crossdock/anc 222
###OK;GUID:222

start 222
###OK;GUID:222

info 222
###INFO: ClientID:MyClientId,State:Started,Connection:failover:(tcp://adak:61625),Last access:1336712578721,Subscriptions:/com/lynden/crossdock/anc;GUID:222

ID:adak-30272-1336692402473-2:2:1:1:1:::JMSCorrelationID=,JMSDeliveryMode=1,JMSDestination=topic:///com/lynden/crossdock/anc,JMSExpiration=0,JMSMessageID=ID:adak-30272-1336692402473-2:2:1:1:1,JMSPriority=0,JMSRedelivered=false,JMSTimestamp=1336712633382,JMSXGroupID=null:::

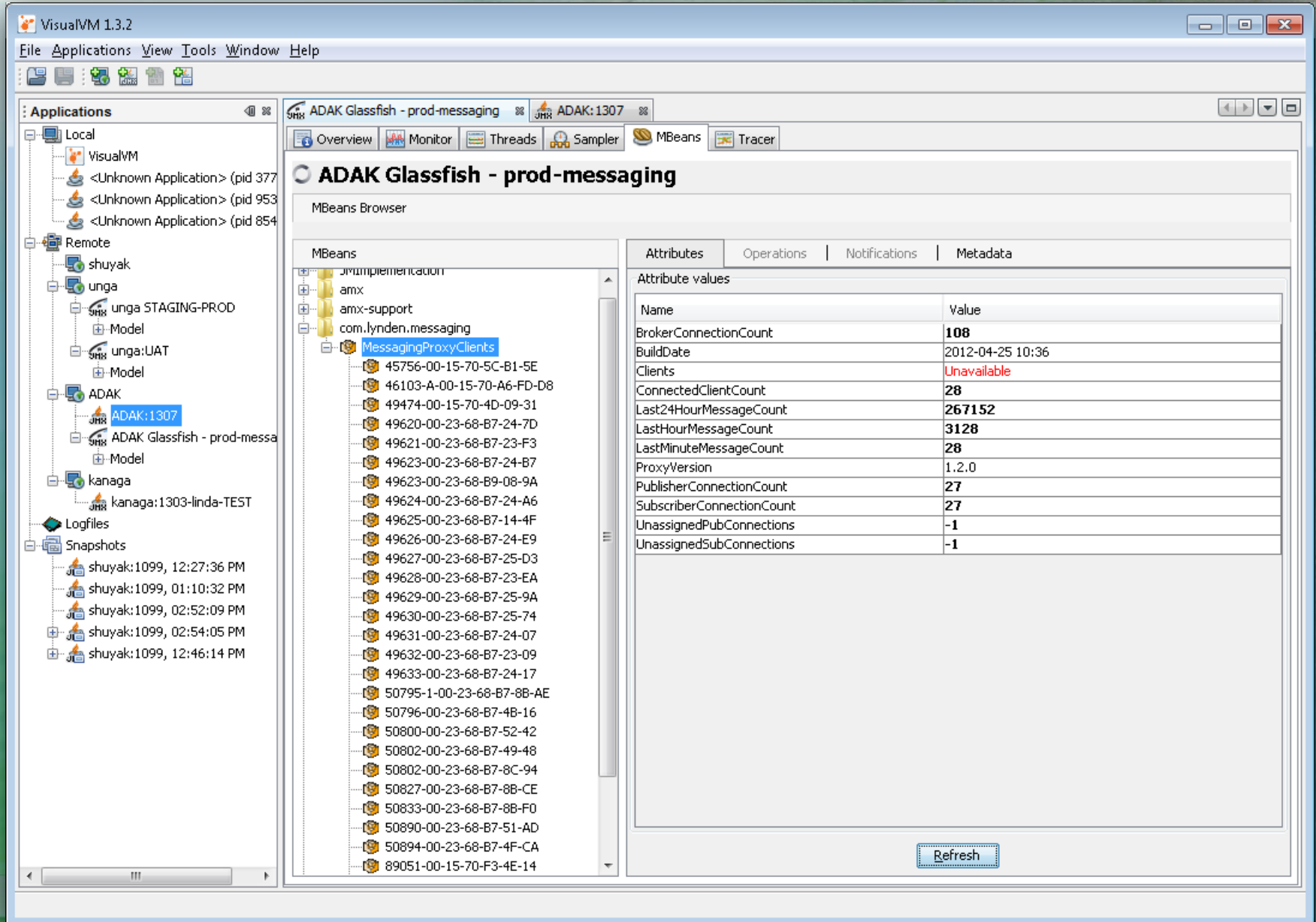
stop 222
###OK;GUID:222

quit 222
###OK;GUID:222

Connection to host lost.
```

- Summary of Proxy related statistics
- Summary of client specific information
- Ability to reset a client's connection to the proxy.





VisualVM 1.3.2

File Applications View Tools Window Help

Applications

- Local
  - VisualVM
  - <Unknown Application> (pid 377)
  - <Unknown Application> (pid 953)
  - <Unknown Application> (pid 854)
- Remote
  - shuyak
  - unga
    - unga STAGING-PROD
    - Model
    - unga:UAT
    - Model
  - ADAK
    - ADAK:1307
    - ADAK Glassfish - prod-messa
    - Model
  - kanaga
    - kanaga:1303-linda-TEST
- Logfiles
- Snapshots
  - shuyak:1099, 12:27:36 PM
  - shuyak:1099, 01:10:32 PM
  - shuyak:1099, 02:52:09 PM
  - shuyak:1099, 02:54:05 PM
  - shuyak:1099, 12:46:14 PM

ADAK Glassfish - prod-messaging

Overview Monitor Threads Sampler MBeans Tracer

ADAK Glassfish - prod-messaging

MBeans Browser

MBeans

- com.lynden.messaging
  - 45756-00-15-70-5C-B1-5E
  - 46103-A-00-15-70-A6-FD-D8
  - 49474-00-15-70-4D-09-31
  - 49620-00-23-68-B7-24-7D
  - 49621-00-23-68-B7-23-F3
  - 49623-00-23-68-B7-24-B7
  - 49623-00-23-68-B9-08-9A
  - 49624-00-23-68-B7-24-A6
  - 49625-00-23-68-B7-14-4F
  - 49626-00-23-68-B7-24-E9
  - 49627-00-23-68-B7-25-D3
  - 49628-00-23-68-B7-23-EA
  - 49629-00-23-68-B7-25-9A
  - 49630-00-23-68-B7-25-74
  - 49631-00-23-68-B7-24-07
  - 49632-00-23-68-B7-23-09
  - 49633-00-23-68-B7-24-17
  - 50795-1-00-23-68-B7-8B-AE
  - 50796-00-23-68-B7-4B-16
  - 50800-00-23-68-B7-52-42
  - 50802-00-23-68-B7-49-48
  - 50802-00-23-68-B7-8C-94
  - 50827-00-23-68-B7-8B-CE
  - 50833-00-23-68-B7-8B-F0
  - 50890-00-23-68-B7-51-AD
  - 50894-00-23-68-B7-4F-CA
  - 89051-00-15-70-F3-4E-14

Attributes Operations Notifications Metadata

Attribute values

Name	Value
BrokerConnectionCount	108
BuildDate	2012-04-25 10:36
Clients	Unavailable
ConnectedClientCount	28
Last24HourMessageCount	267152
LastHourMessageCount	3128
LastMinuteMessageCount	28
ProxyVersion	1.2.0
PublisherConnectionCount	27
SubscriberConnectionCount	27
UnassignedPubConnections	-1
UnassignedSubConnections	-1

Refresh

## The Present

- 24 Warehouse locations
- 100 devices
- In production for Lynden Air Freight & Lynden Transport
- Message Traffic
  - Peak: 900,000 per day
  - Avg: 300,000 per day

## The Future

- 50+ Warehouse locations
- 200+ devices
- Bringing Alaska Marine Lines & Lynden Air Freight online.
- Make piece-level tracking info available on Lynden.com



**It's QUESTION TIME !!**

## *Contact Info*

Rob Terpilowski

Email: [robt@lynden.com](mailto:robt@lynden.com)

Twitter: [@RobTerp](https://twitter.com/RobTerp)

Blog: <http://rterp.wordpress.com>