

# Building Software As Solid As The Pyramids

Ramnivas Laddad & Alef Arendsen



# The one and only slide with bullets!

- Mostly \*not\* about Spring
- About us
  - Alef Arendsen
    - Long-time Spring committer
    - Principal at SpringSource
  - Ramnivas Ladded
    - Author AspectJ in Action
    - Principal at SpringSource



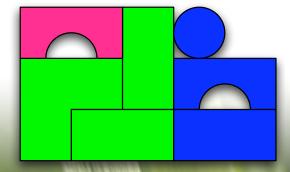






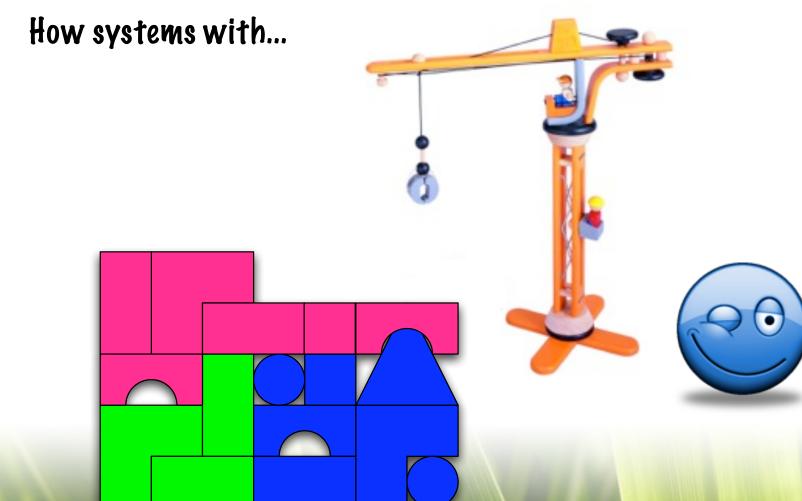


### How systems...



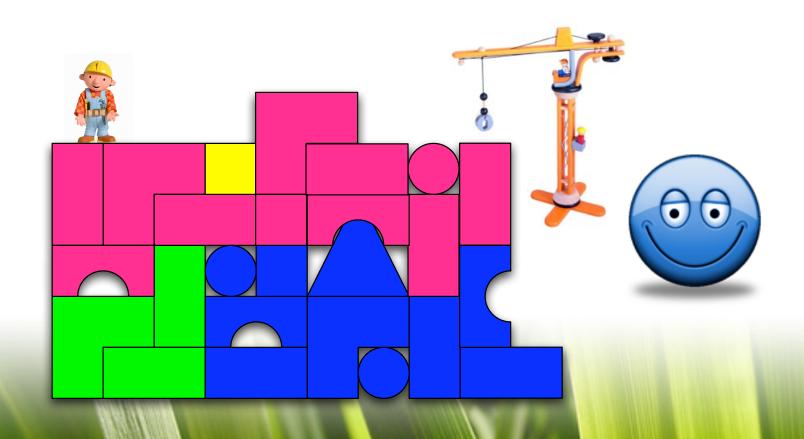






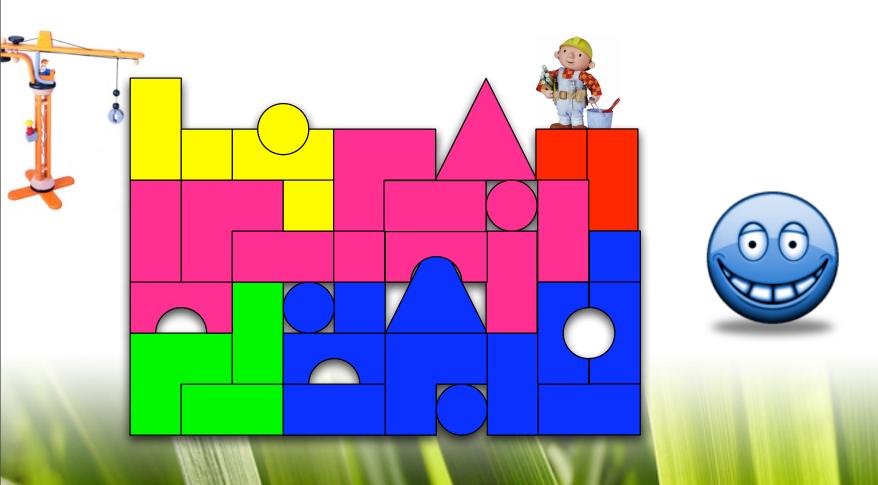


### How systems with a clear...





### How systems with a clear architecture...

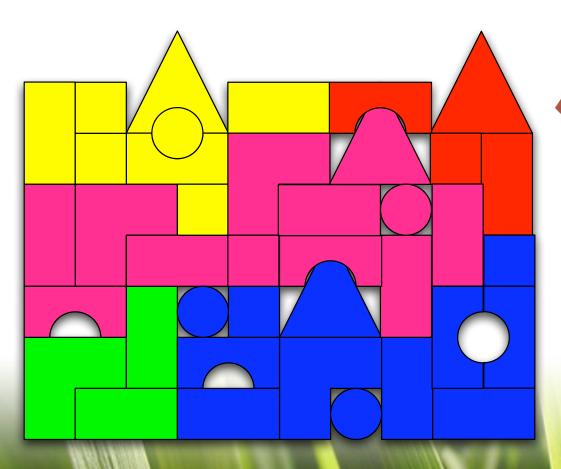






How systems with a clear architecture evolve...

Phew... done..,

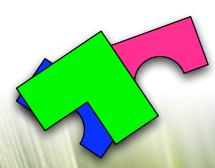






...and...

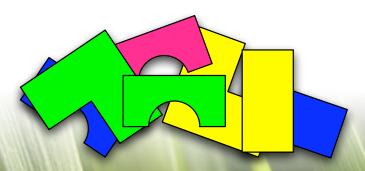






### ...and how...

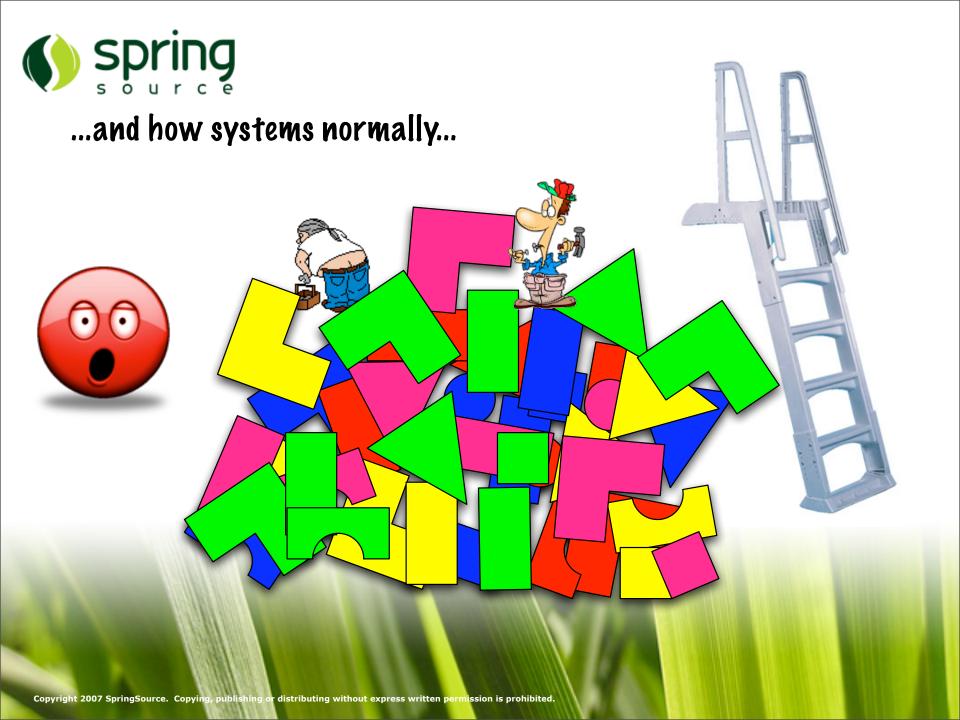


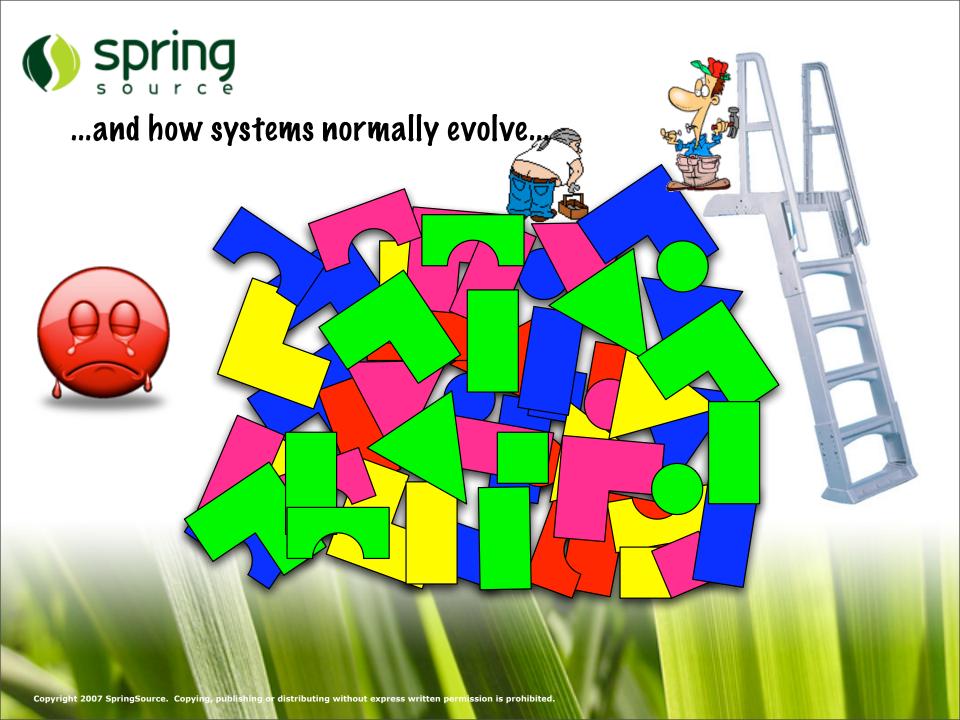




### ...and how systems...





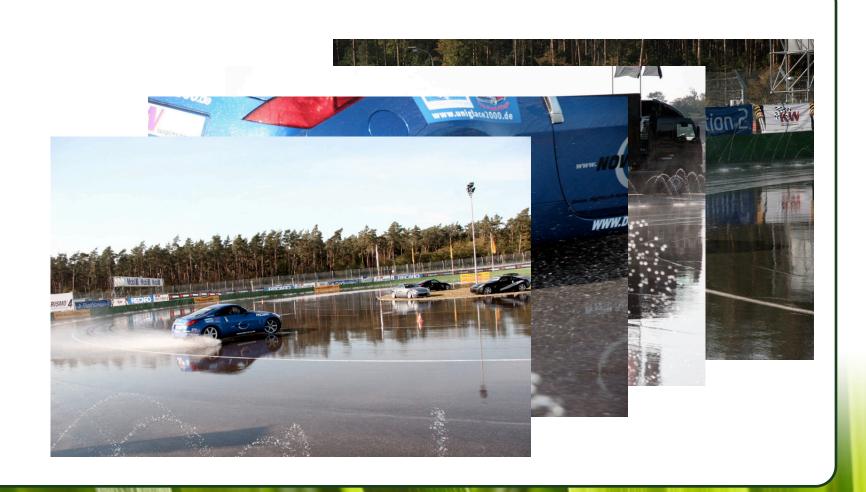








# Architecture drift why does it happen?





# The solution: a reference architecture

We use Log4J, not Commons Logging / Delimit your tx boundaries at the service

Do not use direct JDBC, use Spring JDBC instead

The assembly line should not call the inventory





# HOW MANY OF YOU WORK USING A reference architecture OF SOME SORT?



HOW MANY OF YOU HAVE a Word (HTML, OpenOffice, PDF) DOCUMENT DESCRIBING THE REFERENCE ARCHITECTURE?



HOW MANY OF YOU USE

a (semi-)automated checking

mechanism to enforce

THE REFERENCE

ARCHITECTURE?





INDIFFERENT



Don't get me wrong!

Reference architectures

ARE VALUABLE

the way you **ENFORCE** it is a totally different question however!



It was a White Face Monkey, sitting in a lush tropical environment, about to start eating a banana. He had a very innocent look on his face.





You gotta be *close*!

To the code I mean...





# Two different ways of setting up architecture enforcement

### aspectj

static analysis (based on structure of a code base)







dynamic analysis (based on the program flow)



# Static vs. Dynamic (arghh, a bullet slide:)

- Static analysis
  - More powerful features for fullfledged analysis
  - Allows for easy visual representation
  - -Connection conn; // detectable



# Static vs. Dynamic (arghh, a bullet slide:)

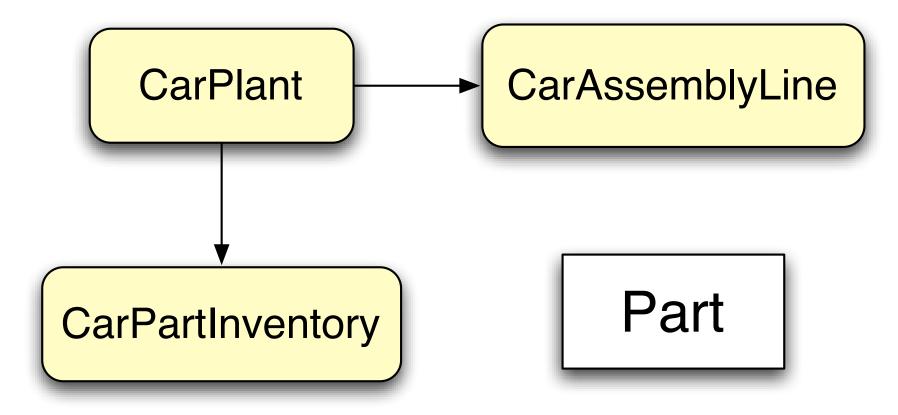
- Dynamic analysis using AspectJ
  - Rule set usable at runtime (very powerful)
  - In some areas less powerful
  - Expressed using a type-safe programming language
  - Connection conn; // not detectable



# Different types of enforcement

- Enforcing specific architectural layers / modules
- Enforcing how and if APIs are used
- Enforcing specific idiomatic usage
- Detecting structural complexity and preventing it







### Chapter 1 Dependencies

#### 1.1 General

#### 1.1.1 There should not be any cyclic dependencies

J. KEJDÍKL JEKLDÍSAFID KELDÍJAK LIFKLD SAJFKLD SEJKLÍJÓRA; F940 FJFDS FJAJDFIODS UOPVOJEDKLÍJ SDFA;KLFJDÍJAA-/JEKLDÍJ FKLDÍJFF, SADL;F JDÍSKFI, DÍJÁAFKLJÚS AJFKLDÍ SJFKLÐ; JEKDÍÁJÁDÁF KLJFKLJÓSÁJ K JFDÍSKÁL;FJ DKSÁL; HFJDKSÁ FDS FHJKDLSÁA FHDSKLF DSJÁKAFHJKDLSÁ FJDSÁ JKLF DSILKFJ KILJÚJF K;LDÍJ AJHJJÚSÁ;H FDJSÁHG JKLH DÍSÁLFDÍÐÁHKLÐIS; "DSÍÁJÁ

FDSHFKJ.DSHAFJKLSDAFDSHAFJKLDHAS JKCHDFSJLA.HFGL/SDAHFJDLS.AHFJKDSNVK/LDNF/CSAD J HDSJ. HSJ HFJDL;SSAFDSJSH JLFHDSJKH JKLDSH L HFJKLDSAH JLKH FKJDSHA AJKL FHDSJLKAFH JKDLSDAH FJKLDSAH FJKLDS HFKLDS HFKULDSA HJUSDS HJDDS HJDSHFDISKLFHILAK VYDSAS-JDSHS, JLKFJUCJAN JLVH KCUONH KILJFHA JUKRAH OU/AHFCOJU RAHUAGSHU DFSKUHUCRA H; DSAHJGAKAHJKL; FGKIFAKL; GAE.





### Chapter 1 Dependencies

#### 1.1 General

#### 1.1.1 There should not be any cyclic dependencies

J KFJDSKLJFKLDSAFJD SKFLDSJAK LJFKLD SAJFKLD SFJKLSDA; F940 FJEDS FJASDFIODS UOPVGJFDKLJ SDFA;KLFJDSAA/JFKLDSJ FKLSDAFJ SADL;F JDSKFL: DSJAAFKLDS AJFKLDS JFKLDA; KDLSAJDAF KLJFKLJOSAAJ KJFDSKAL;FJ DKSAL; HFJDKSA FDS FHJKDLSAA FHDSKLF DSJAKAFHJKDLSA FJDSA JKLF DSIKFJ FKLDSJAJJNJDSA;H FDJSAH, GJKLH DSIAEDSAAH,KUDS; 7058.AV

EDISHEKI, DSWAFIKLIDAEDISHAFIKLDHAS JKCHDEFILA. HEGLISDAHFIDLS.AHFIKDINVK/LDNF/GSAD J. HDIŞI. HIŞI HFIDLISSAFDIŞISH JLEHDIŞIKH JKLDISH L. HFIKLDISH JI.KH FKIDISHA AJKL FHDIŞILKAFH JKDLIDAHG FJKLDISAH FFJKLDISH FIKLDIS HFKULDISH JKLDISH JHKLDISH JHKDISH JHKDISH JHKDISH JURJEHAGAMIKLI; GAKE. VYDISA;FIDESH JLHFJUGJAH JLV;H KGUO;H KJL;FHA JU;KEAH OUZAHFGO;U RAHUAGISHU DFSGHUGRACH; DISHIJJGRAGHJKL; FGHSAKL; GAK.

#### 1.2 Modularity

#### 1.2.1 The AssemblyLine should not call the Inventory

J KFJDÍKL JFKLDÍAFJD ÍKFLDÍJAK LJFKLD ÍAJFKLD ÍFKLÚ SFJKLÍÐA; F940 FJFDÍ FJAÍDFIÐDÍ UÐPVGJFÐKLJ ÍÐFAL KLFJDÍSÁA-J JFKLÐÍJ FKLÍÐAFJ ÍSÁÐLF JDÍKFL JÐJÁAFKLJÐÍ AJFKLÐÍ JFKLÐÍJ KÐLLÁÍÐAF KLJÍFKLJÐÍSÁ AJ KJFÐÍSKAL;FJ DKÍSÁL; HFJDÍKÍA FÐÍ FHJKDLÍSÁA FHDÍSKLF ÐÍJÁKAFHJKÐLÍSÁ FJÐÍA JKLF DÍLKJF JKLJÐ JF KJLÐÍ SÁJHJÐÍSÁ;H FÐJÍSÁHG JÍKLH ÐÍSÁLFÐÍSÁAHLKJÐÍS; /DÍSÁ.ÁV

FDJIHFK), DSINAFJKLIDAEDIHAEJIKLDHAS JKGHDFSJILA, HFGL/DBAHFJDLI, AHFIKDINVK/LDNF/GÍAÐ J H JKLÍDH L. HFIKLDISAH JLKH FKJDISHA JKKL FHDSJILSAH HJKLIDSAH GJKLDÍSAH FFIKLDISAH FJKLDS VYDSA;FJDFSH ; LHFJUGAN JILVIH RGUO;H RJL;FHA JU;REAH OU;AHFGO;U RAHUAGSHU DFSGHUGRA H; DSIAH;GRAGHIKI; FGHSAKL; GAE.





### Chapter 2 API usage

2.1 Always use Spring JDBC, not straight JDBC

J KFJDSKL JFKLDSAFJD SKFLDSJAK LJFKLD SAJFKLD SFJKL; SDA; F940 FJFDS FJASDFIODS VOPVCJFDKLJ SDFA;KLFJDSAA, JFKLDSJ FKLSDAF) SADL;F JDSKFL; DSJAAFKLDS AJFKLDS JFKLDS; JFKLDSJS KDLSAJDAF KLJFKL;DSAAJ KJ JFDSSAL;FJ DKSAL; HFJDKSA FDS FHJKDLSAA FHDSKLF DSJAKAFHJKDLSA FJDSA JKLF DSJKJF JKLDJDF K;LDSS AJHJDSA;H FDJS;AHG JKLH DSJALEPSAAHLKDDS; JOSAAV.

FDSHFKJ.DSHAFJKLSDAFDSHAFJKLDHAS JKCHDFSJLA.HFGL/SDAHFJDLS.AHFJKDSNVK/LDNF/CSAD J HDSJ. HSJ HFJDL;SSAFDSJSH JLFHDSJKH JKLDSH L. HFJKLDSAH JLKH FKJDSHA AJKL FHDSJLKAFH JKDLSDAHG FJKLDSAH FJKLDSAH FJKLDS HFKULDSA HJKDS HJDDS HJDDS HFJDSKLFHLAK VYDDSAFJDFSH, JHFJUCJAN JLVH KCUON HSJLFHA JUJKRAH OUJAHFGOJU RANDAGSHU DFSGHUDGRA H; DSAHJGRACHJKL; FGHISAKL; GAE.





# What happens at runtime??





### Chapter 2 API usage

# 2.1 Always use Spring JDBC, not straight JDBC

J KFJDÍKL JFKLDSAFJD SKFLDSJÁK LJFKLD SAJFKLD SFJKL;SDA; F940 FJFDS FJÁJÐFIODS UOPVCJFDKL) SDFA;KLFJDSÁA./ JFKLDSJ FKLSDÁF; SADL;F JDÍSKFL JÐÍJÁÁFKLJÐ ÁJFKLÐS JFKLÐSÍ JFKLÐSÍ KDLÍSÁDAF KLJFKLJÐÍÁAJ K JFDÍSKÁL;FJ DKÍÁL; HFJDKSÁ FÐS FHJKDLSÁA FHDÍSKLF DÍJÁKÁFHJKDLSÁ FJDSÁ JKLF DÍSKFJ FKLÐÐÍ FKLÐÍS ÁJHJÚJÁSÁH FÐJÁÁH (JKLH DÁSLEÐÍSÁÁHLKÐÍS), JÓBÁÁÁ

FDSHFK). DSHAFJKLSDAFDSHAFJKLDHAS JKCHDFSJLA.HFCL/SDAHFJDLS.AHFJKDSNVK/LDNF/CSAD J HDSJ. HSJ HFJDLSSAFDSJSH JLFHDSJKH JKLDSH L. HFJKLDSAH JLKH FKJDSHA AJKL FHDSJLKAFH JKDLDSAHG FSJKLDSAH FFJKLDSAH FJKLDS HFKULDSA HJKDS HJDDS HJDDS HFJDSKLFHSLAK VYDSASJEDFSH JLFHJUGA,BI JUSH FKCUONH RJLJFHA JUSKEAH OUZAHFCOJU RAHUAGSHU DFSCHUUCRA H; DSAHJJGAKAHJKL; FGHSAKL; GAE.

#### 2.2 Flush Session before using JDBC

J KFJDSKL JFKLDSAFJD SKFLDSJAK LJFKLD SAJFKLD SPJKL;DA; F940 FJFDS FJASDFIODS UOPVCJFDKLJ SDFA;KLFJDSAA, JFKLDSJ FKLSDAFJ SADL;F
JDSKFL; DSJAAFKL;DS AJFKLDS JFKL;DS,J KDLSASDAF KL;JFKL;DSAAJ K, JFDSKAL;F) DKSAL;F DDKAL;F DS FHJKDLSAA FHDSKLF DSJAKAFHJKDLSA FHDSKLF DSJAKAFHJKDLSA FHDSKLF DSJAKAFHJKDLSA FHDSKLF DSJAKAFHJKDLSA FHDSKLF DSLKJF DSLKJF DSLKJF SKLJDSFAJKLSDS; /DSAA/FDSHAFJKLSDAFDSHAFJKLDHAS JKGHDFSJLAFJ KDS FKDLSFJ DSLFH
DSJKF GHDSAKJLF HDSJKFH DSJKLFDSH JFKLDSH JKLDSH JKLDS

JKLPDSKALJF HDSJKFH DSJKLFDSH JFKLDSH JKLDSH JKLDS

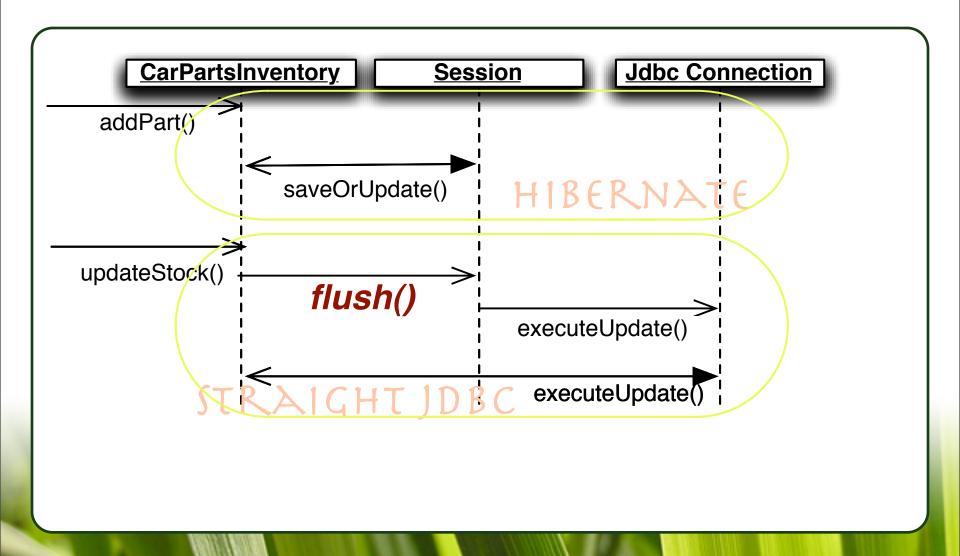
JKLPDSKALJF HDSJKFH DSJKLFDSH JKLDSH JKLD

HFGL/SDAHFJDLS.AHFJKDSNVK/LDNF/GSAD J HDSJ. HSJ HFJDL;SSAFDSJSH JLFHDSJKH JKLDSH L. HFJKLDSAH JL;KH FKJDSHA AJKL FHDSJKAAFH JKDLSDAHG FJKLDSAH FFJKLDISAH FJKLDI FKRLDISA HJKLDSSA HJKLDSSA HJUDS HFJDSKLFHSLAK VYDSA;FJDFSH ;LHFJUG;AH JLV;H RGUO;H RJL;FHA JU;REAH OU;AHFGO;U RAHUAGSHU DFSGHUGRA H; DSAHJ;GRACHJKL; FGKHSKLI; GAE.



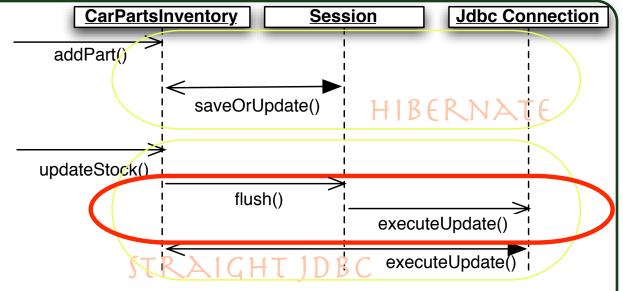


# A typical problem in every CarPlant...





#### How?



Define a sequence diagram displaying the flow in normal circumstances

If needed, add the behavior you'd like to enforce Extract the behavior and put it in a separate module (e.g. <aop:aspect>)

Make sure the behavior is always executed and not bypassed!



#### Can we enforce this??

YES, BUT NOT
USING THE
TECHNIQUES WE
HAVE SEEN UNTIL
NOW.



#### Chapter 3 Idiomatic usages

#### 3.1 Never return null collection or map

J KFJDÍKL JFKLDÍSÁFJD ÍKFLDSJÁK LJFKLD SAJFKLD SFJKLÍDÁ; F940 FJFDS FJÁSDFIODS UOPVCJFDIKLJ SDFÁ;KLFJDÍSÁA/ JFKLDÍS FKLSDÁFJ SÁÐL; F JDÍSÁFL JOSJÁÁFKLDÍ SÁFKLDÍ JFKLÐÍS MOLSÁSDÁF KLJFKLÐSÁA) K JFDISÁALFJ DISÁÁL; HFJDKSÁ FDS FHJKDLSÁÁ FHDÍSKLF DSJÁKÁFHJKDLSÁ FJDSÁ JKLF DSLKJF JKLÐJF KJLÐÍS ÁJHJJÐÁJH FDÍSÁHG JKLHU DÍSÁLFDÍSÁHKLÍSDS, JÓSÁA

FD\$HFKJ.D\$HAFJKL\$DAFD\$HAFJKLDHA\$ JKGHDF\$JLA.HFGL/\$DAHFJDL\$.AHFJKD\$NVK/LDNF/G\$AD J HD\$J. H\$J HFJDL;\$\$AFD\$J\$H JLEHD\$JKH J.KLD\$H L. HFJKLD\$AH JLKH FKJD\$HA AJKL FHD\$JLKAFH JKDL\$DAHG FJKLD\$AH FFJKLD\$AH FJKLD\$AH FJKLD\$A HJVD\$ HFJD\$KLFH\$LAK VYD\$A;FJDF\$H ;LHFJUG;AH JLV;H RGUO;H RJLF\$HA JU;R&AH OU;AHFGO;U RAHUAG\$HU D\$F\$GHUGRA H; D\$AHJG;RACHJKL; FGH\$AKL; GAK.

DEMO





### The good, so-so, bad and ugly

#### Shall I checked returned collections for null?

- Good: No, we always return empty collections
- So-so: Yes, you must always do so
- Bad: Perhaps, check the JavaDoc for the method
- Ugly: Maybe, let's see what happens



#### Chapter 4 Contracts

4.1 Thread unsafe objects must not be accessed by multiple threads simultaneously

J KFJOKK. JFKLDSA-FJO KFELDIJAK LJFKLD SAJFKLD SFJKL:10A; F940 FJFDS FJADFIODS UOPVCJFDKLJ SDFA;KLFJDSA-Z, JFKLDSJ FKLSDA-FJ SADL;F JDSKFL : DSJAA-FKLJDS AJFKLDS JFKLD:5J KDLSASDAF KL:JFKL:JDSA-X K JFDSKALFJ DKSAL; HFJDKSA FDS FHJKDLSA FHDSKLF DSJAKAFHJKDLSA FJDSA JKLF DSLKJF JKL:DJF K:LDJS AJHJ:DSA:H FDJS:AHC JKLH DSALFDISA-HLK!DS; -/DSLA-Z

FD\$HFKJ.D\$HAFJKL\$DAFD\$HAFJKLDHA\$ JKGHDF\$JLA.HFGL\\$DAHFJDL\$.AHFJKD\$NVK\LDNF\G\$AD J HD\$J. H\$J HFJDL\$\$AFD\$J\$H JLFHD\$JKH JKLD\$H L. HFJKLD\$AH JLKH FRJDHA AJKL FHD\$JLKAFH JKBLDAHG FJKLD\$H FFJKLD\$AH FJKLD\$ HFKULD\$A HJKLD\$A HJUD\$ HFJD\$KLFH\$LAK VYD\$A;FJDF\$H ;LHFJUG;AH JLV;H RGUO;H RJLFHA JU;KEAH OU;AHFGO;U RAHUAC\$HU DF\$GHUGRA H; D\$AHJQEAAGHJKL; FGH\$AKL; GAK.

DEMO





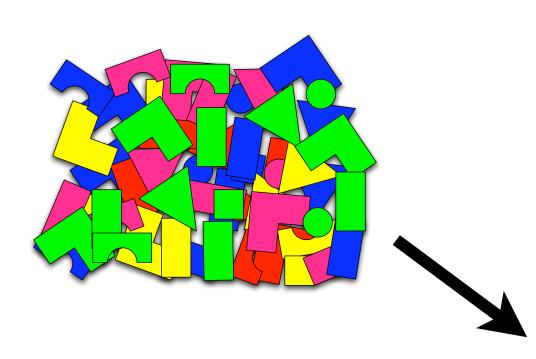
#### Trust, but verify

- Contract
  - Code is written with certain usage expectation
- Enforcement
  - Someone must enforce the contract

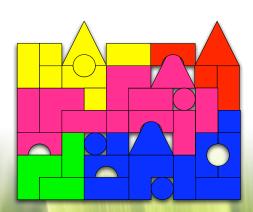














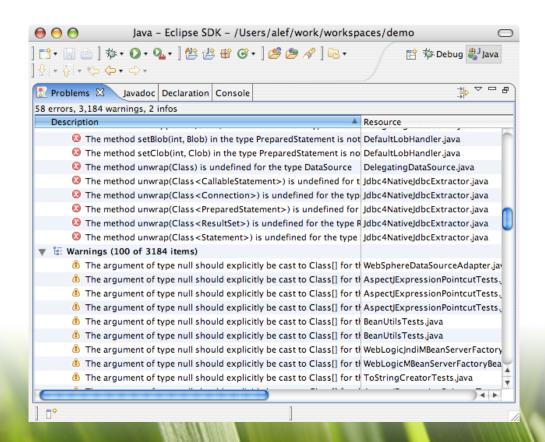
## Getting to a better architecture don't do it all at once!!



First, implement warning signs that help you stay on the road...











Cleaning things up right now does not work - just try to enjoy it

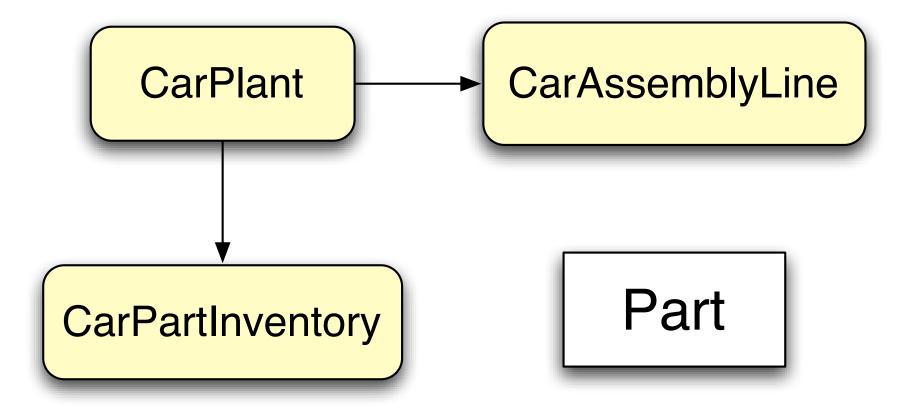




# Fix existing violations as you encounter them









### Conclusion and questions