JCC LogMiner Loader implementation at the Dutch Railway Company

From pilot to mission-critical

VX Company
ENTERPRISE IT

www.vxcompany.com

From pilot to mission-critical

Jack Broer
VX Oracle & Java

VX Company IT Services B.V.
E JBroer@vxcompany.com
I www.vxcompany.com

VX Company

From pilot to mission-critical

- Replication in the past
- Pilot
- 1-1 replication
- 14-1 replication
- 14-1-1 replication
- 14-1-2 replication
- Mission-critical
- Replication in the future

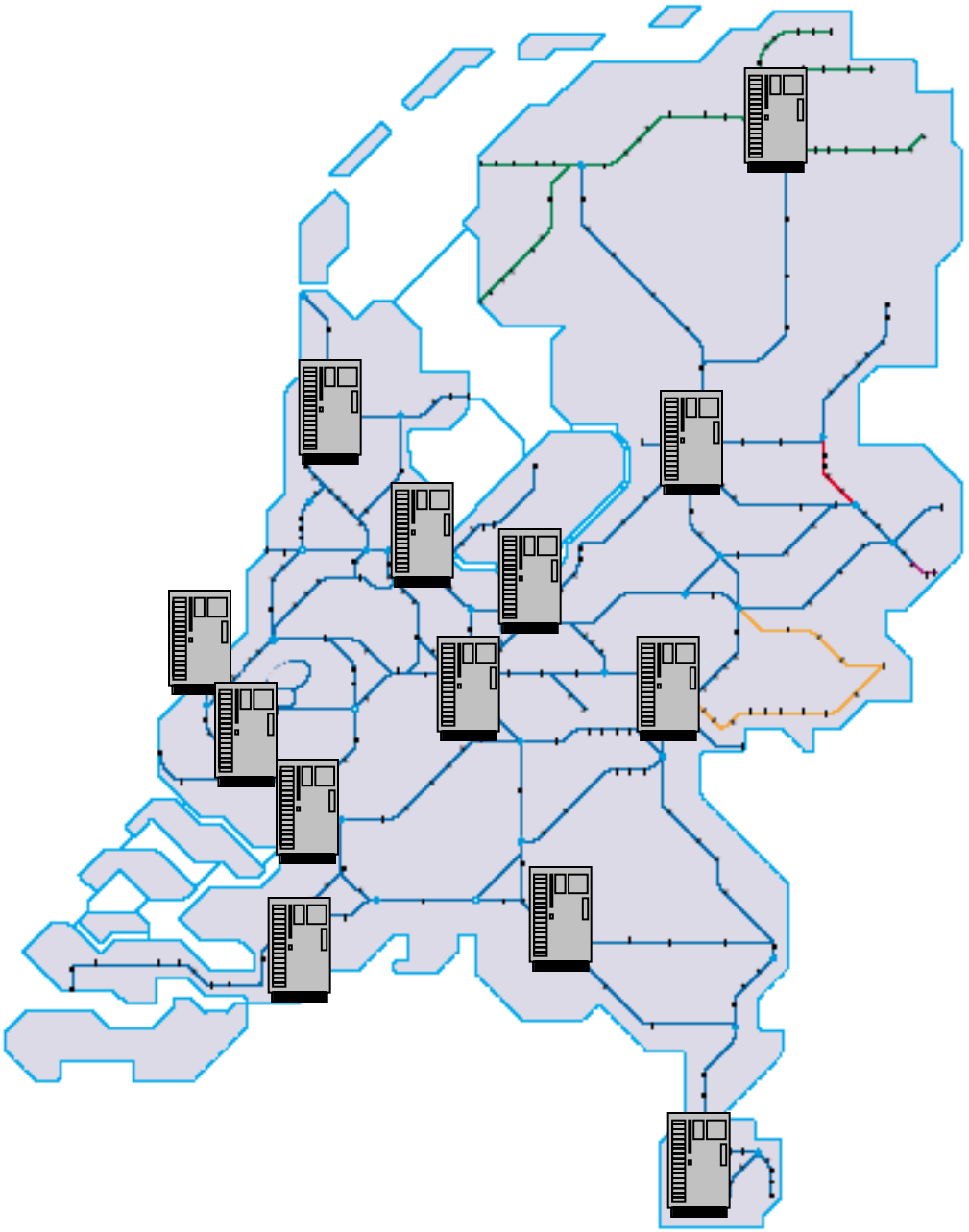
From pilot to mission-critical

Replication in the past

VKL

Traffic Control System Characteristics

- OpenVMS + Oracle Rdb
- 13 single-node systems
- 13 databases
- 95% National timetable data
- 5% Local configuration data
- High-frequency small updates
- 13-13 replication
- Custom made with DMQ

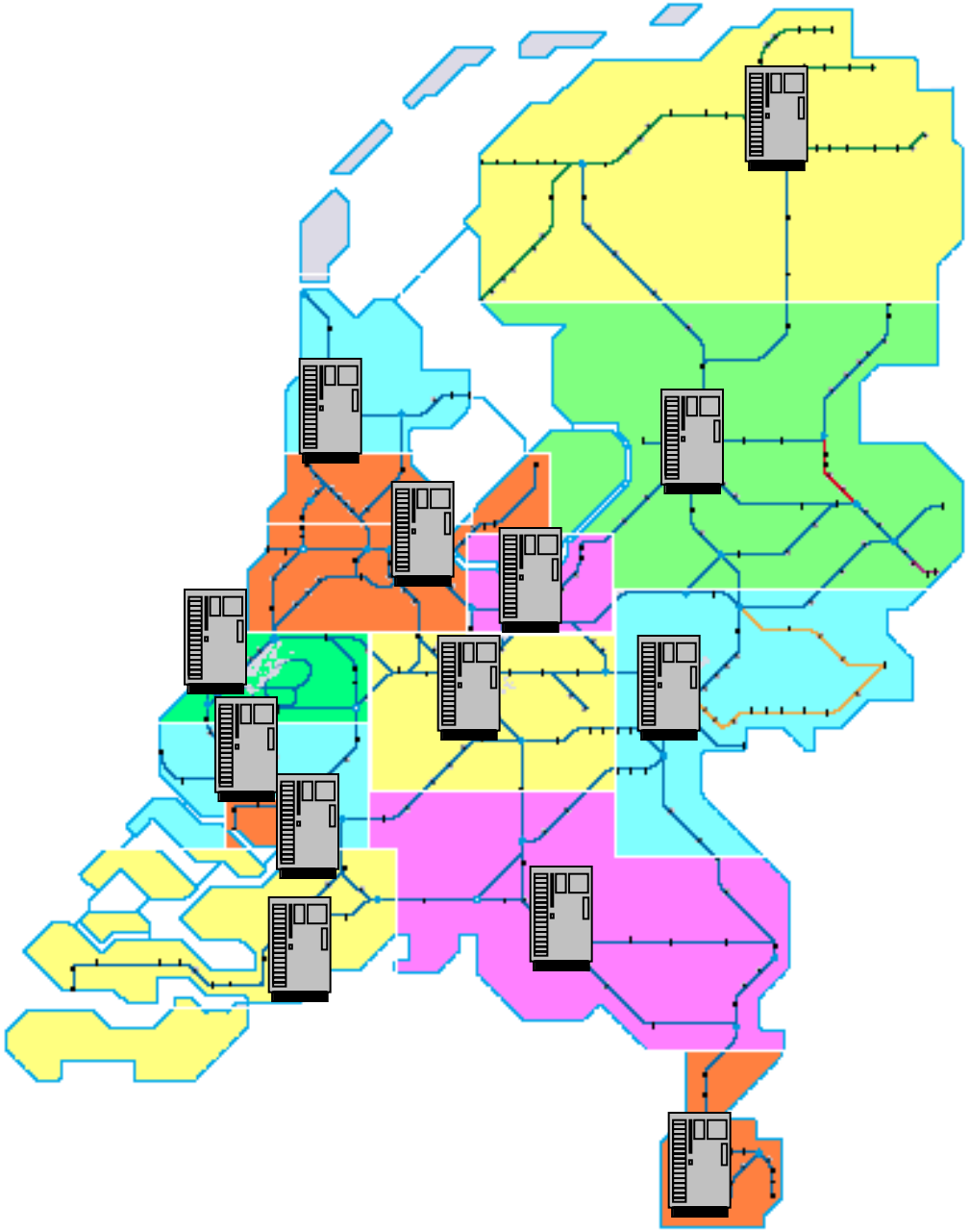


VX Company

PRL

Process Control System Characteristics

- OpenVMS + Oracle Rdb
- 13 single-node systems
- 13 databases
- 90% Regional timetable data
- 5% Inter-regional timetable data
- 5% Local configuration data
- High-frequency small updates
- 1-13-13-1 replication (via VKL)
- Custom made with DMQ



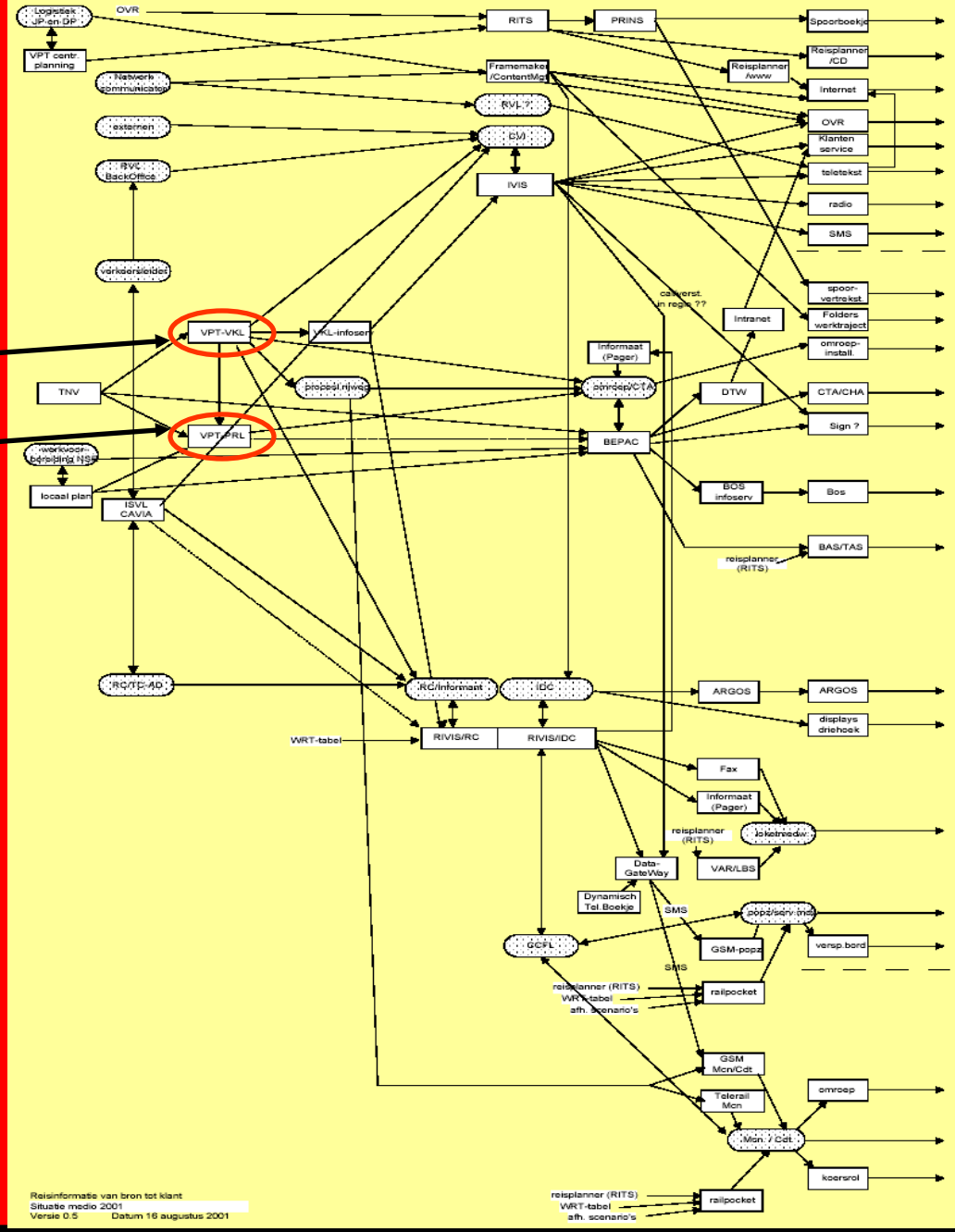
VX Company

Problems

- Inflexible interface layout
- Hand made Communication Servers for each interface
- Incompatible DMQ/BMQ versions
- Complex handshake and keep-alive mechanism
- Inconsistency between databases
- Very expensive custom made interfaces
- Overwhelming number of interfaces

Some Logical Interfaces

- VKL
- PRL



VX Company

From pilot to mission-critical

Pilot

VX Company

Goal

- Test replication from 2 PRL databases to 1 standalone database

Problems & Solutions

- AIJ not enabled
  - Enable AIJ
- Downtime for each (13) source database
  - Start implementing replication with (single) VKL-database
- No DECNet available
  - Use TCPIP to access RDB$REMOTE
- Bad performance
  - Tuning of TCPIP buffers
- Conservative user organization against enabling of AIJ
  - Proof, with performance tests, the low impact of AIJ
- No time to test everything
  - Test the rest in production because of low impact

Lessons learned

- No real replication related problems were found
- Hardly noticeable performance impact by AIJ (can be tuned)
- JCC LML had no performance impact at all
- Biggest problem is convincing the user organization of low impact
- Replication with JCC LML is straight forward
- JCC LML comes with scripts for some standard configurations
- Scripts and configuration files are well documented
- Generated configuration files are easy to adjust
- Support by JCC is superb

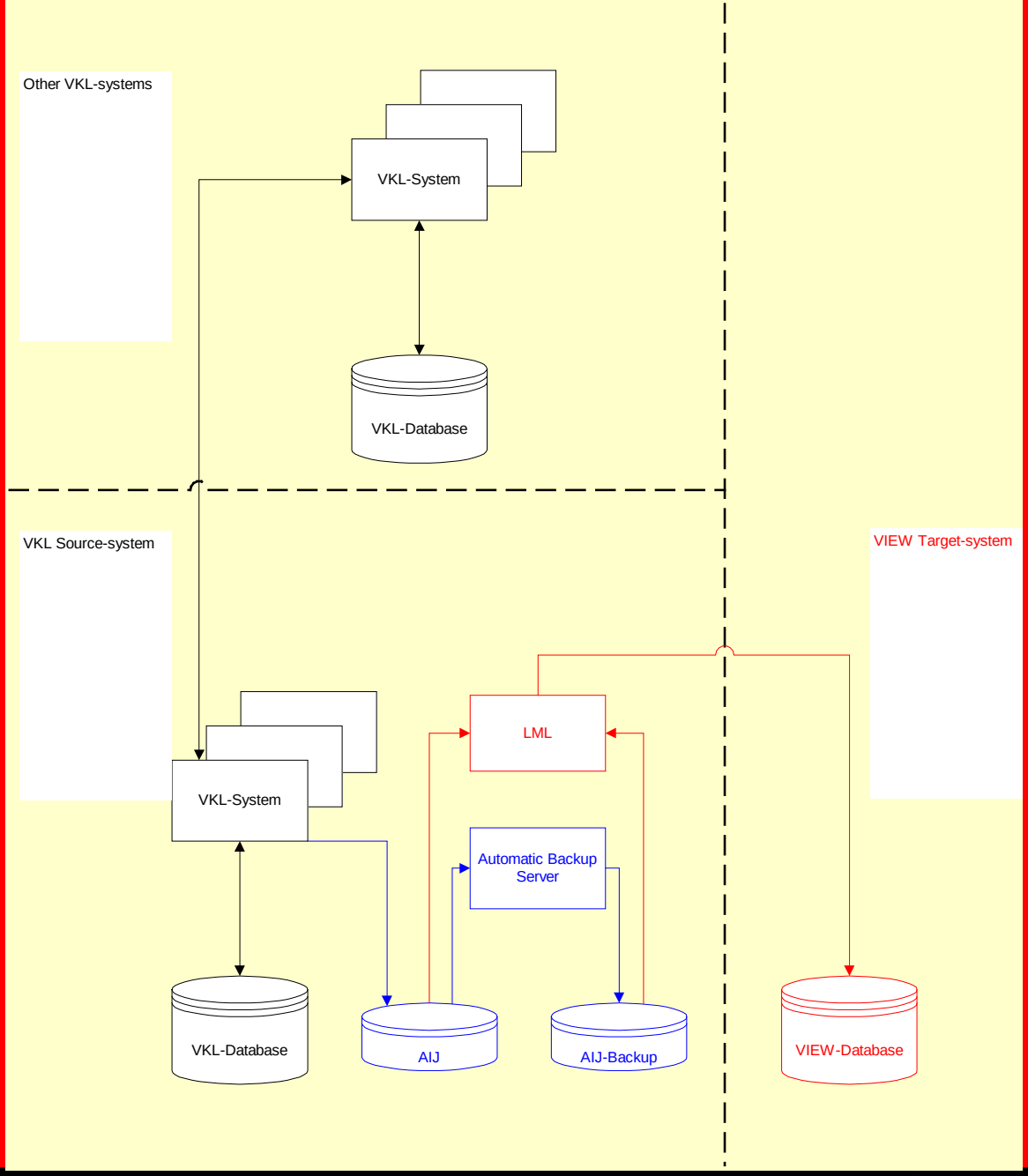
From pilot to mission-critical

1-1 replication

VX Company

Goal

- Replicate production VKL-database 1-1 to VIEW-database
- Convince user organization with stable and low-impact replication


Other VKL-systems
VKL-System
VKL-Database
VKL Source-system
VIEW Target-system
LML
VKL-System
Automatic Backup Server
VKL-Database
AIJ
AIJ-Backup
VIEW-Database

VX Company

Problems & Solutions

- No formal acceptance for the enabling of AIJ and JCC LML
  - Extend the Pilot to a special production site “Luisterpost”
- Unsupported OpenVMS and Oracle Rdb versions
  - JCC tested and now supports LML on our OpenVMS (7.1-1) and Oracle Rdb (7.0.6.5) versions
- No changes allowed other than enabling AIJ and JCC LML
  - No need to change anything else than enabling AIJ and JCC LML
- 1 obscure 2-pass delete-insert-update transaction was found
  - Small change of index in target database solved the problem
- Bad performance during catch-up after long downtime
  - Tuning of TCPIP buffers and JCC LML Commit Interval

Lessons learned

- No real replication related problems were found
- Biggest problem is convincing the user organization of low impact
- Transactions remain atomic but internal order may be different
- High performance replication under all conditions
- Support by JCC is superb

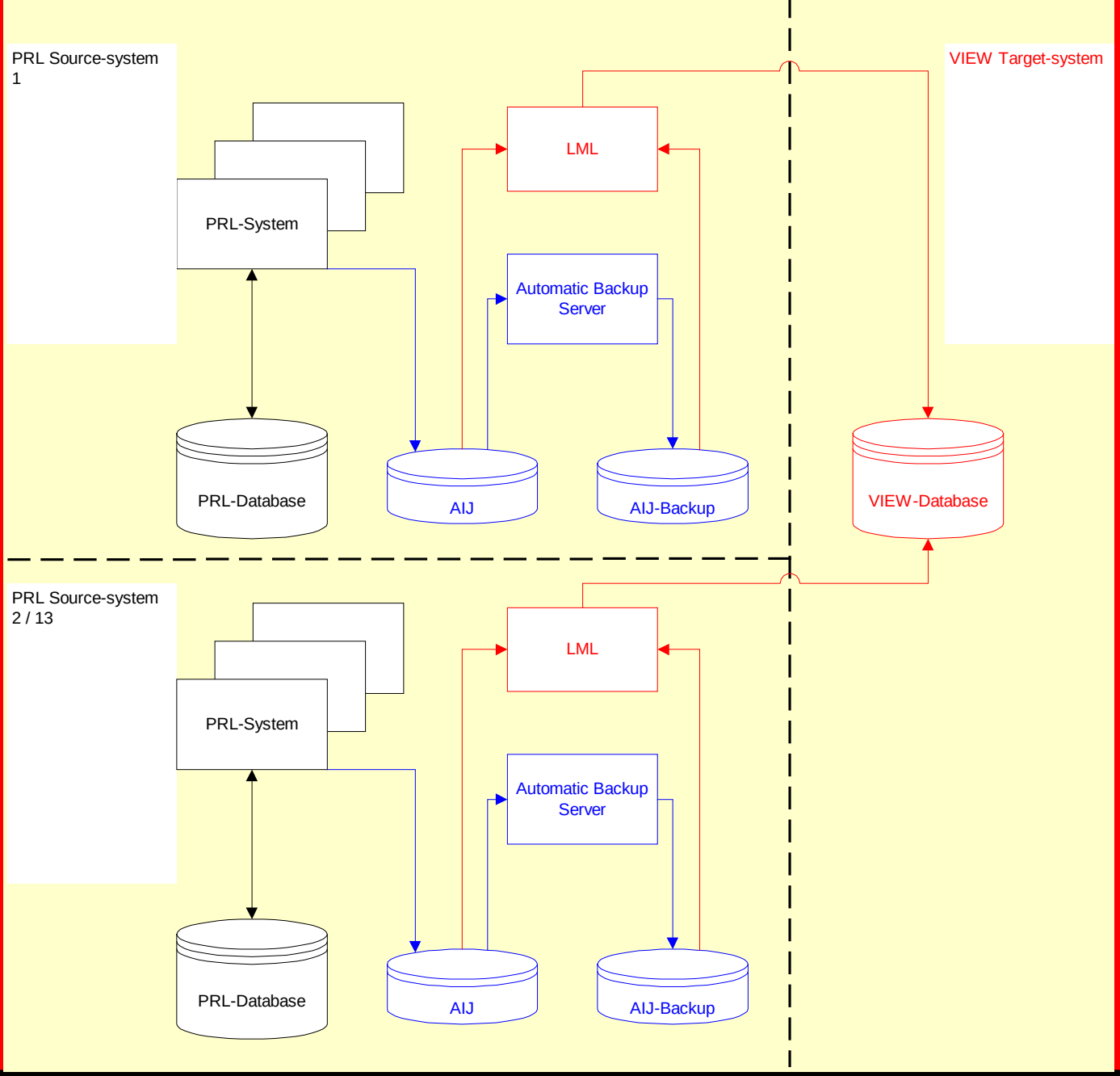
From pilot to mission-critical

14-1 replication

VX Company

Goal

- Add replication of 13 PRL-databases to the VIEW-database
- Convince user organization with stable and low-impact replication


PRL Source-system
1
PRL-System
PRL-Database
LML
Automatic Backup
Server
AIJ
AIJ-Backup
VIEW Target-system
VIEW-Database
PRL Source-system
2 / 13
PRL-System
PRL-Database
LML
Automatic Backup
Server
AIJ
AIJ-Backup

Problems & Solutions

- Still no formal acceptance for the enabling of AIJ and JCC LML
  - Extend the Pilot to first PRL production site “Amersfoort”
- Minimal downtime allowed on each PRL-system (7x24)
  - Create and test scripting for enabling AIJ
  - Combine with planned application upgrades
- Combining with planned application upgrades takes 12 months
  - Start with most interesting sites for follow-up plans

Lessons learned

- No real replication related problems were found
- Biggest problem was convincing the user organization

From pilot to mission-critical

14-1-1 replication

VX Company

Goal

- Create VKL and PRL look-alike applications
- Publish them (read-only) on the intranet

ProRail VIEW Client - Microsoft Internet Explorer aangeboden door Railinfrabeheer

Bestand Vensters Baanvakdrempels 1 2 3 4 8:88

PVT
- Asd-Atw
- Asd-Em
- Asn-Eem
- Asn-Vdm
- Aswpln-Aswplm
- Atw-Asd
- Bd-Vl
- Bh-Hfdo

TNV
- AMA
- AMF
- GOOI
- KIP
- KIP_AMA_VEL
- VEL_AMA_KIP
- VEL_AMA_ST
- VELUWE

PPR
- AMF
- BHV
- BNC
- BNVA
- BRN
- BSD
- DDR
- DHSA

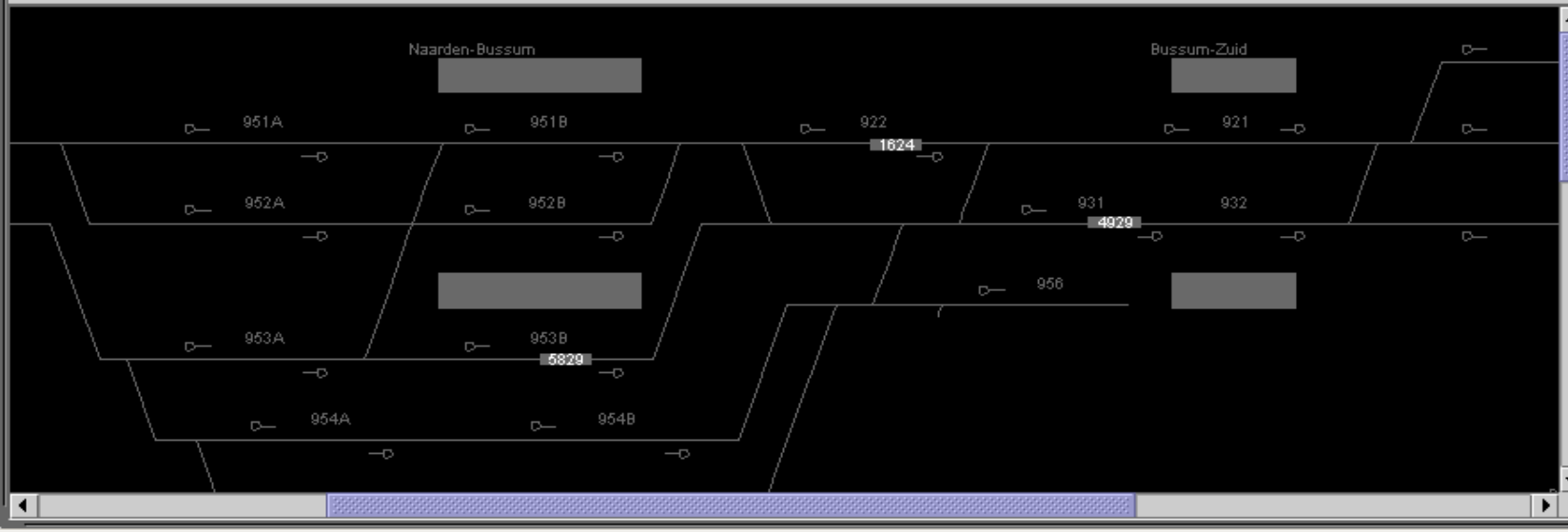
AMF 9:31

	5827	V	9:22	0	Amf	9:21	5B	302	-	
/	1726	V	9:27	-2	Amf	9:26	6A	BF	-	
	20726	V	9:27			9:26	7	PA	-	m
	1629	A	9:33	+1	Hvs	9:28	RA	2B	-	m
	726	V	9:30	-2	Amf	9:30	7	PA	-	m
+	408280	R	9:08			9:20	DU	4A		
	21629	A	9:36	0	Brn	9:31	RA	2B	-	m
	529	A	9:36	0	Bhv	9:31	AD	1B	-	
+	53902	V	9:33			9:32	41	PA	-	
	7428	A	9:37	+1	Bnc	9:32	CS	4B	-	
	5828	A	9:38			9:33	302	7	-	
	82180	V	9:36			9:35	4A	BF	-	m
	529	V	9:38	0	Bhv	9:37	1B	VF	-	
	5628	A	9:42	0	Pt	9:37	HF	6A	-	
	7429	A	9:43	0	Bloa	9:38	AD	1B	-	
	1629	V	9:40	+1	Hvs	9:39	2B	SC	4 -	m
	5629	A	9:46			9:41	AD	2B	-	
	5628	V	9:43	0	Pt	9:42	6A	BF	-	
	53300	V	9:44	-1	Amf	9:43	9A	BF	-	
	5828	V	9:44			9:43	7	PA	-	

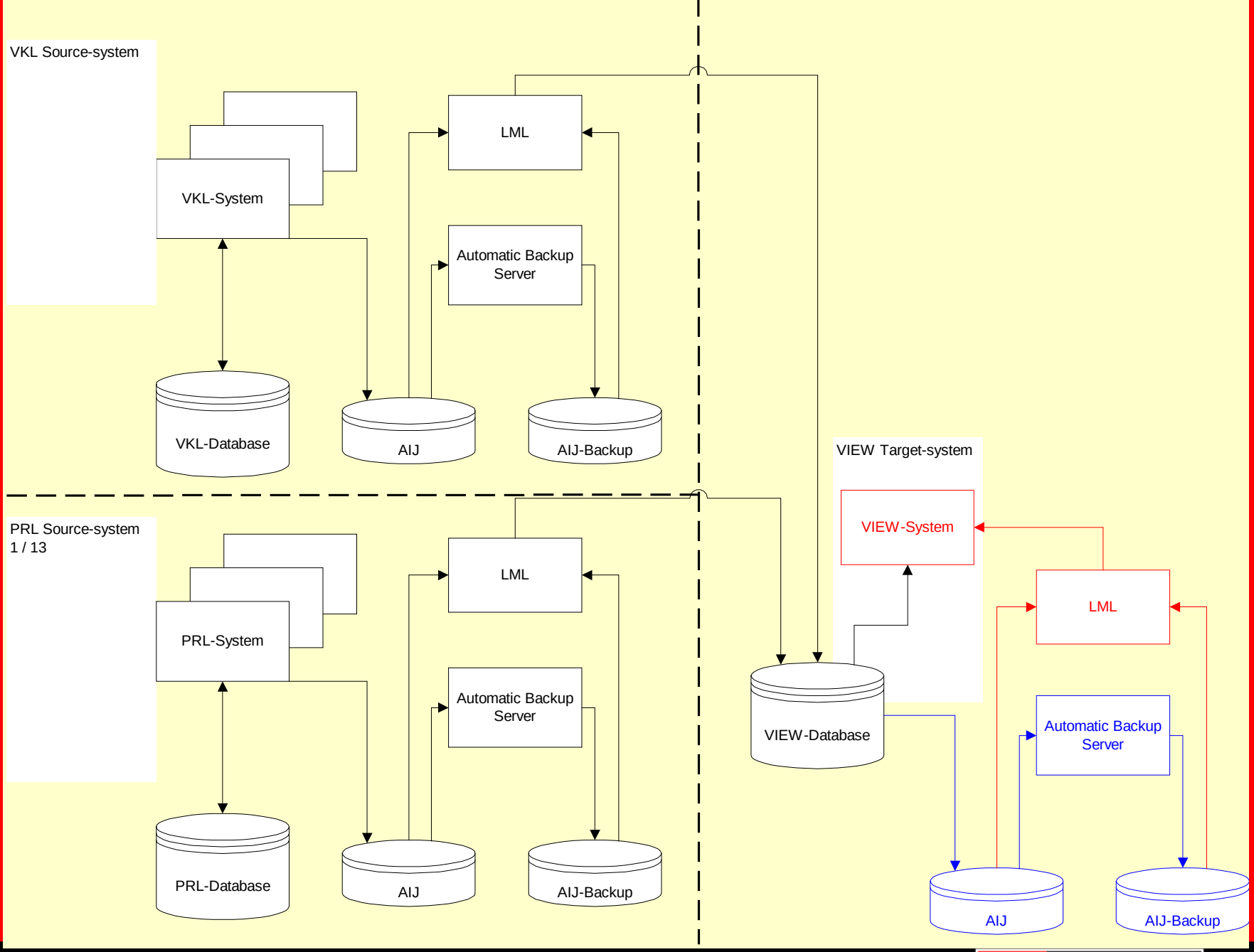
Asd-Em 9:30

	3931	Asd		
		|		
		Ods		
		|		
		Dgrw		
		|		
	833	Asdma	924	+2
		|		
		Asdm		
		|		
+2	4033	Asa		
+3	3031	|		
		Dvd		
		|		
		Dvaz		
		|		
		Asb		
+3	7331	|		
		Gnbr		
		|		

GOOI



VX Company


VKL Source-system
VKL-System
LML
Automatic Backup Server
VKL-Database
AIJ
AIJ-Backup
PRL Source-system
1 / 13
PRL-System
LML
Automatic Backup Server
PRL-Database
AIJ
AIJ-Backup
VIEW Target-system
VIEW-System
LML
VIEW-Database
Automatic Backup Server
AIJ
AIJ-Backup

VX Company

Problems & Solutions

- Replication VKL/PRL -> VIEW is not part of the application but application should show movement of trains
  - Let JCC LML send database updates to the application
- User wants to see replication status in the application
  - Use JCC LML's heartbeat mechanism and replicate this to the application
- Communication with other (non-Rdb) sources is done with BMQ
  - Send JCC LML XML-output to JBMQ-gateway

Lessons learned

- JCC LML is very versatile and can be used in many areas
- JCC LML solutions were cheap and quick to implement

From pilot to mission-critical

14-1-2 replication

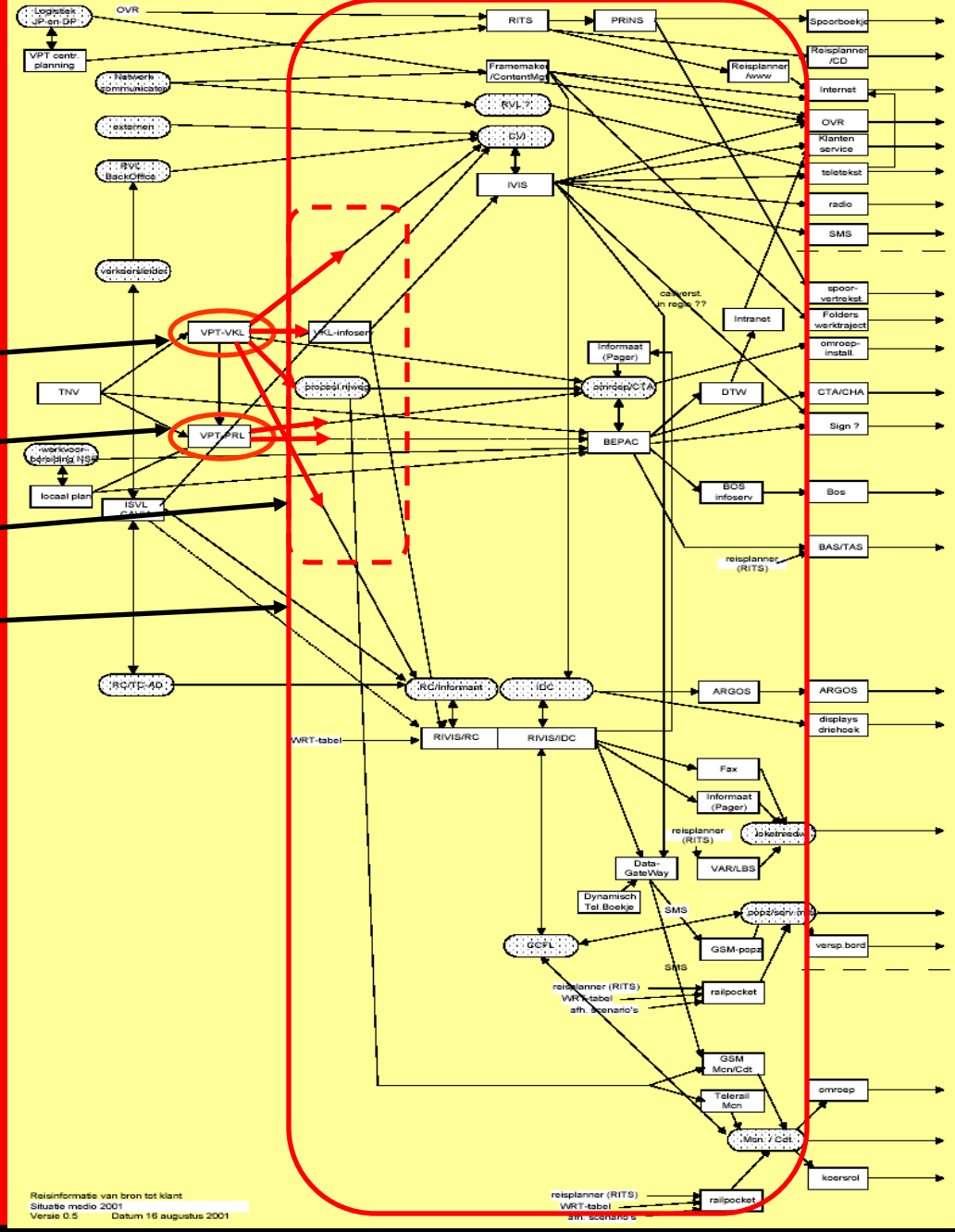
VX Company

Goal

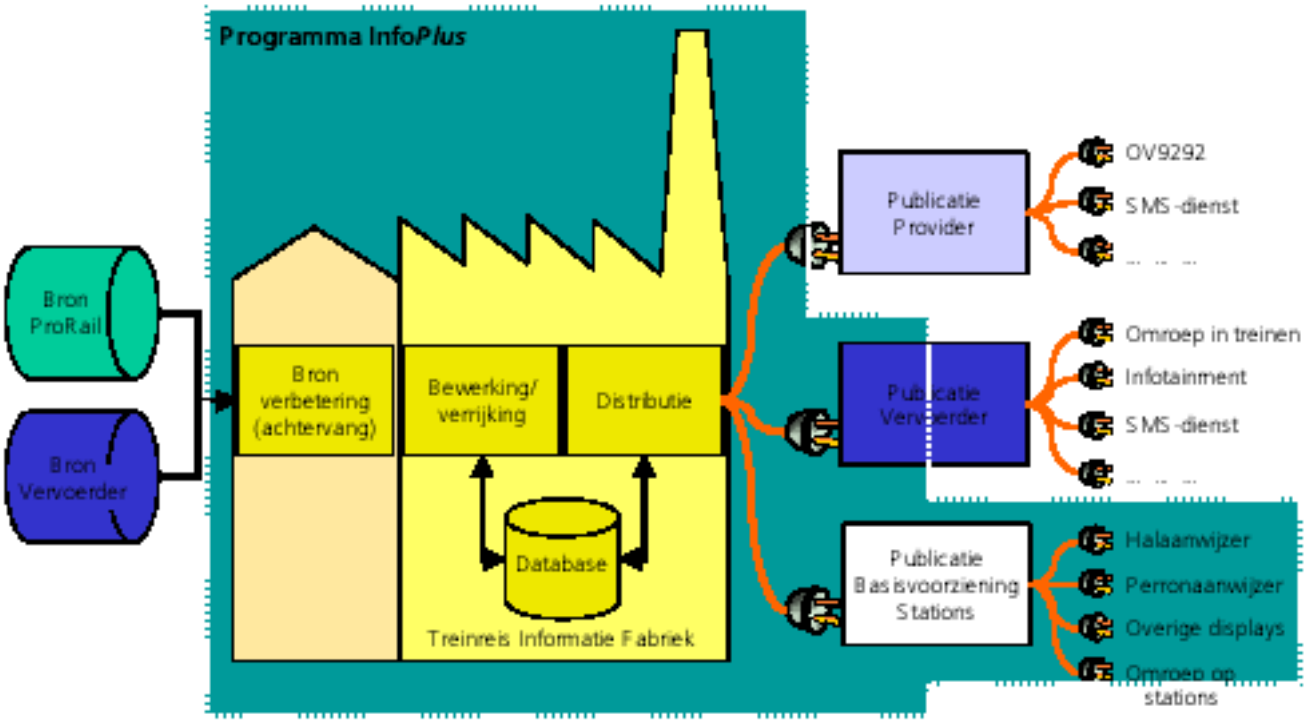
- Create an interface to the first (paying) user

Some Logical Interfaces

- VKL
- PRL
- VIEW
- TIF

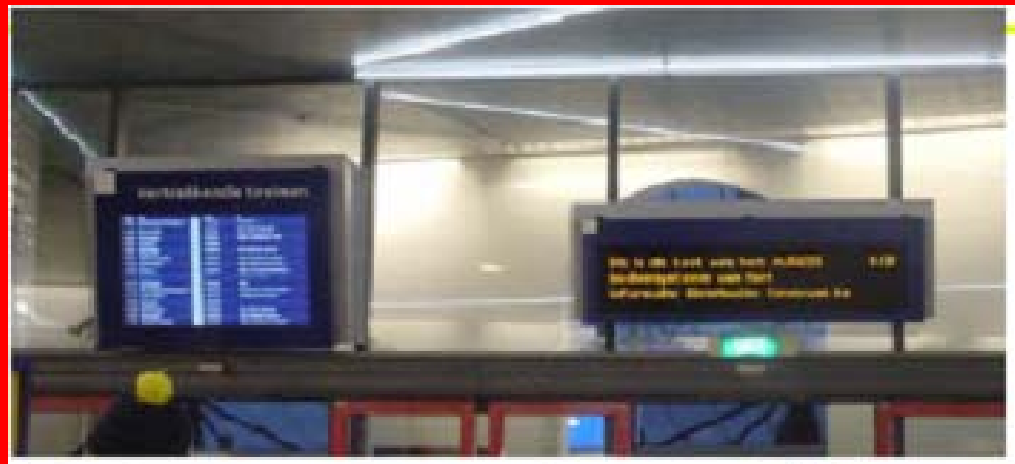


The Yellow Factory

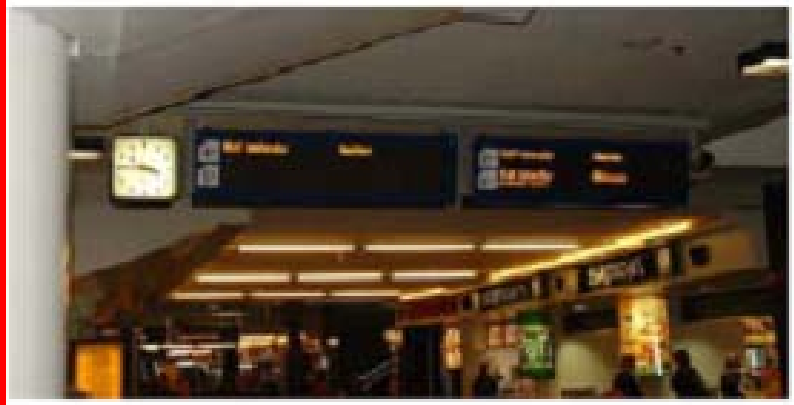


VX Company

Railway stations



TAS en Argos
(voorbeeld: Zwolle)



DRIS Amsterdam
Tunneldisplays Amsterdam Centraal

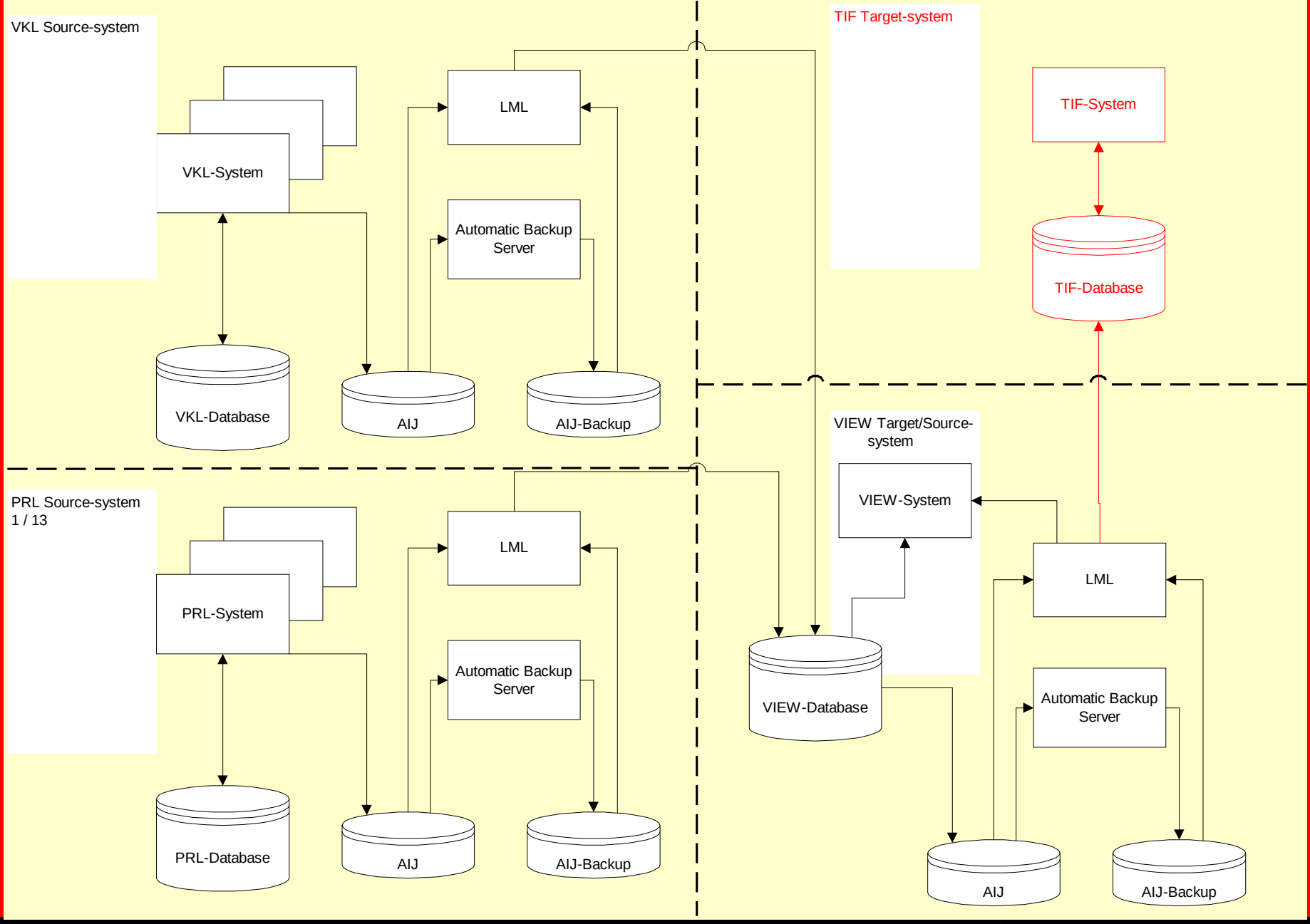
IDRIS Almelo
Gecombineerde bus/trein informatie

VX Company

Trains

VX Company

Travelers


VKL Source-system
VKL-System
LML
Automatic Backup Server
VKL-Database
AIJ
AIJ-Backup
TIF Target-system
TIF-System
TIF-Database
VIEW Target/Source-system
VIEW-System
LML
VIEW-Database
Automatic Backup Server
AIJ
AIJ-Backup
PRL Source-system
1 / 13
PRL-System
LML
Automatic Backup Server
PRL-Database
AIJ
AIJ-Backup

Problems & Solutions

- TIF is using Oracle “classic” in stead of Oracle Rdb database
  - JCC LML supports Oracle 9i (among others)
- Shareable image ident mismatch due to early Oracle 9.2 version
  - JCC recompiled JCC LML with Oracle 9.2.0.4
- TIF needs data from all VKL and PRL systems
  - Speed up the JCC LML implementation on the PRL systems
- TIF will be Mission Critical and demands high availability
  - Make replication from VKL/PRL via VIEW high available

Lessons learned

- JCC LML comes with scripts for Rdb>Oracle replication setup
- Support by JCC is superb

From pilot to mission-critical

Mission-critical

VX Company

Goal

- Make replication of Mission Critical data possible
- Make replication high available

Problems & Solutions

- Replication from one single VKL node is not high available
  - Implement VKL system on an OpenVMS cluster
- Replication from 13 single PRL nodes is not high available
  - Implement PRL systems on OpenVMS clusters
- Replication to/from one single VIEW node is not high available
  - Implement VIEW system on an OpenVMS cluster
- Implementing OpenVMS clusters will take at least 12 months
  - Start with VKL and VIEW systems

Lessons learned

- To be patient
- Implementing replication is very easy, with small amount of effort
- Most of the work is done in other areas

From pilot to mission-critical

Replication in the future

VX Company

Goal

- There’s no clear goal for future forms of replication, only idea’s

Problems & Idea's

- Inflexible, complex, handmade, DMQ/BMQ-based interfaces
  - JCC LML-based replication interfaces could replace them
- Inconsistency between databases
  - Hardly seen with JCC LML
  - Might be corrected by using the Data Pump mechanism
- Overwhelming number of interfaces
  - Number of logical interfaces is reduced by TIF
  - Number of physical interfaces could be reduced by enriching VIEW database with data from other sources

Problems & Idea's (continued)

- Management Information Systems are loaded with old data
  - JCC LML could provide "near real-time" data
- VIEW applications are read-only
  - Could JCC LML do something here?

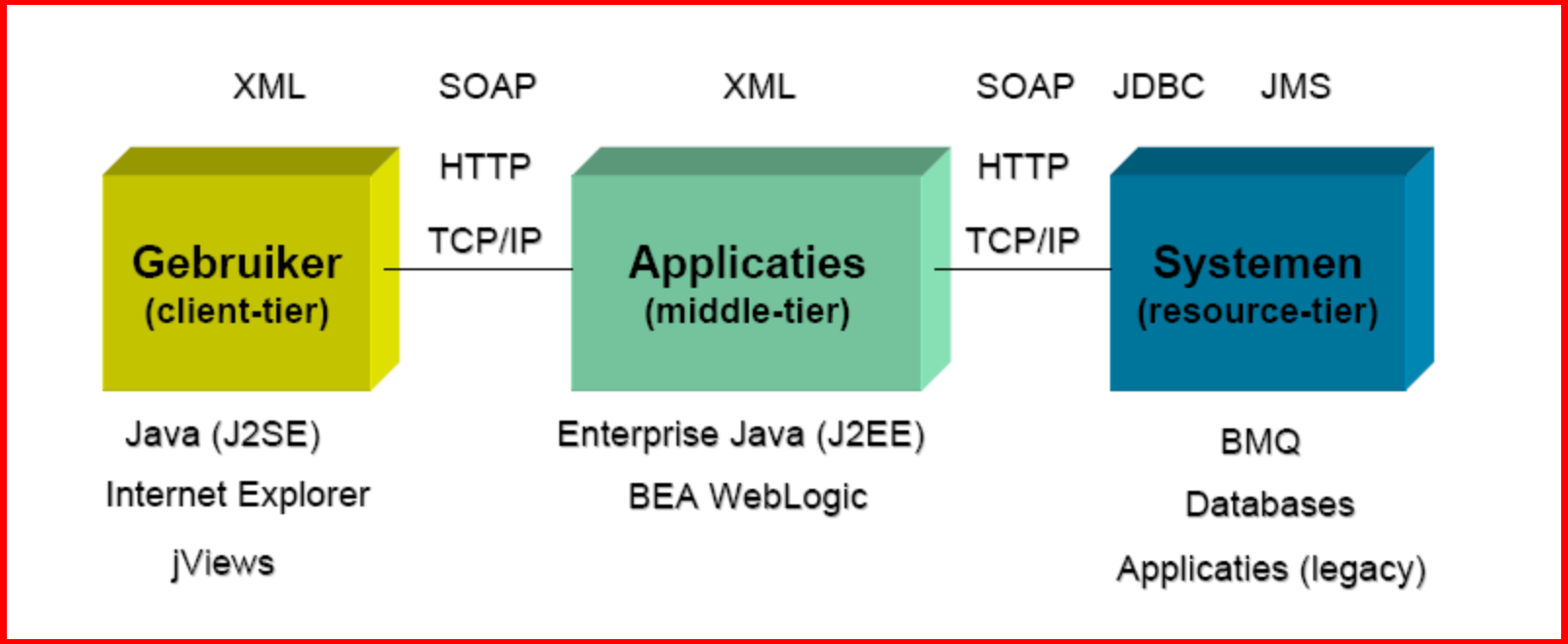
- Do you have any idea's?

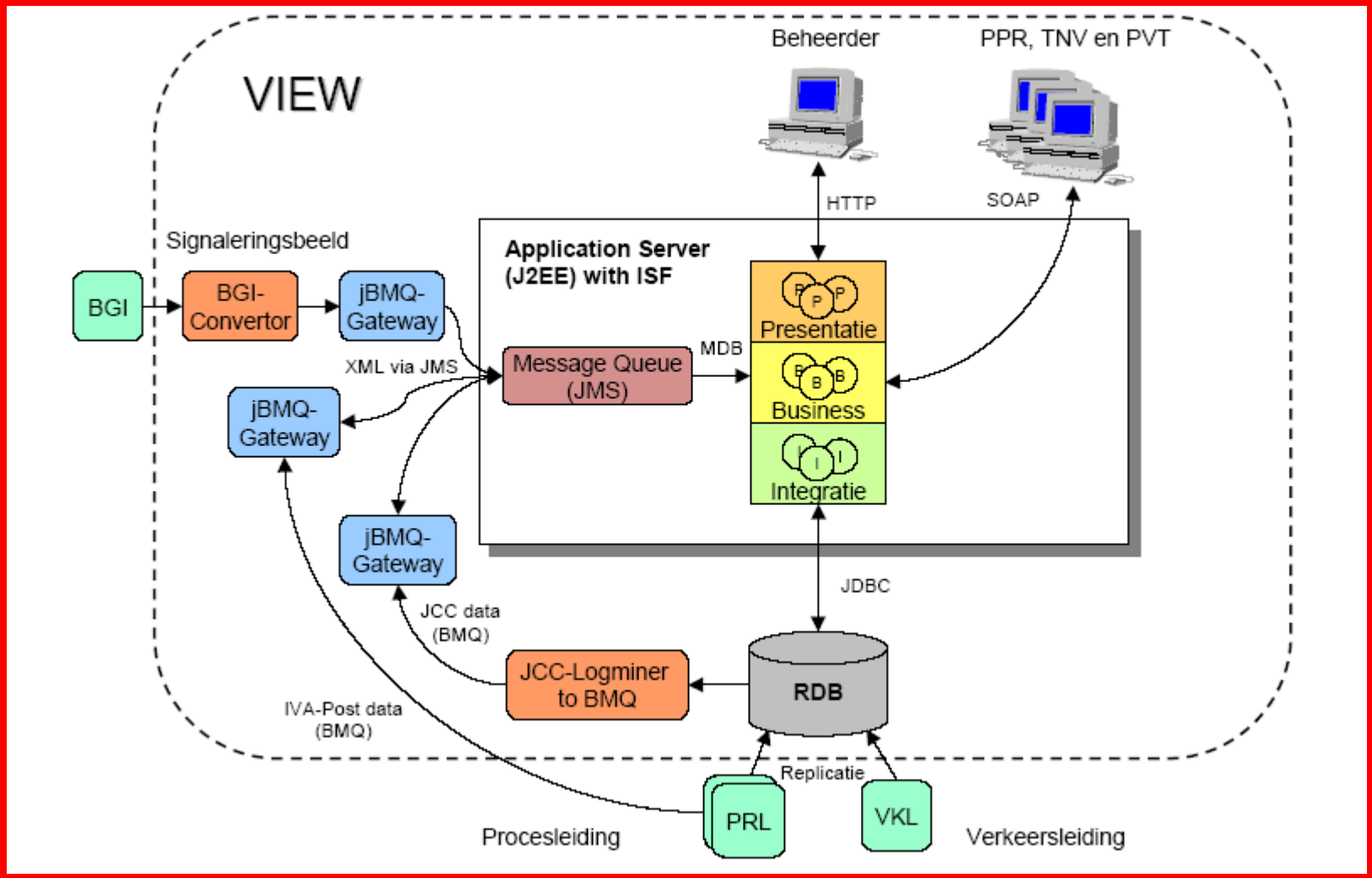
Questions?

For more information

- www.oracle.com/rdb
- metalink.oracle.com
- otn.oracle.com
- www.jcc.com
- JBroer@vxcompany.com

VX Company


XML
SOAP
XML
SOAP
JDBC
JMS
HTTP
HTTP
TCP/IP
TCP/IP
Gebruiker
(client-tier)
Applicaties
(middle-tier)
Systemen
(resource-tier)
Java (J2SE)
Internet Explorer
jViews
Enterprise Java (J2EE)
BEA WebLogic
BMQ
Databases
Applicaties (legacy)


VIEW
Beheerder
PPR, TNV en PVT
HTTP
SOAP
Signaleringsbeeld
BGI
BGI-Convertor
jBMQ-Gateway
Application Server (J2EE) with ISF
Presentatie
Business
Integratie
MDB
Message Queue (JMS)
XML via JMS
jBMQ-Gateway
jBMQ-Gateway
JDBC
JCC data (BMQ)
JCC-Logminer to BMQ
RDB
IVA-Post data (BMQ)
Replicatie
PRL
VKL
Procesleiding
Verkeersleiding