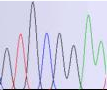




# Custom made Middleware

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**LabHelp**  
**UMCG Groningen**



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# Introduction

## 2011 – UMCG, Groningen, Clinical Virology

The amount of samples is no problem....  
It's the amount of data transfer that is  
the problem!



### **Bert Niesters**

1st

University Medical Center Groningen, Division of Clinical Virology.

Groningen Area, Netherlands | Hospital & Health Care

Current University Medical Center Groningen

Previous Erasmus University Medical Center, ErasmusMC, SSDZ Laboratories, CalTech, Pasadena, CA (U.S.A.)

Education University of Utrecht

Send a message

500+  
connections



# Middleware

Average molecular lab:

- ✓ Equipment for different purposes.  
(LIS – isolation – liquid handling – amplification)
- ✓ Connectivity between equipment from different diagnostic and research companies not common.
- ✓ Own specific workflow / wishes.

**Solution: custom made middleware**



# Middleware – how?

## ✓ Analysis of workflow

- Physical samples
- Data (virtual samples)



- ✓ Build modular middleware based on workflow.
- ✓ Result 2011: Flow Groningen - FlowG



# FlowG – Isolation module

FlowG

Isolation Analysis Controls Assays Quit

PCR\_RESP\_1294\_JOB  
PCR\_PARAINF\_1230\_JOB  
PCR\_AD-80-PCP-MYCO\_629\_JOB  
PCR\_ENTERO\_1136\_JOB

FlowG number: 230  
Working list number: 1689  
Working list name: PCR\_HERPE\_S\_1689\_JOB-PCR\_JCBK\_949\_JOB  
Working list date: 22-11-2011

Samplnr	Lastname	Initials	Material	Test	Isolation
11017032E	Patient T	M.C.	PLE	BK	<input checked="" type="checkbox"/>
11017033E	Patient T	M.C.	UR	BK	<input checked="" type="checkbox"/>
11017035E	Patient U	M.R.	PLE	BK	<input checked="" type="checkbox"/>
11017036E	Patient U	M.R.	UR	BK	<input checked="" type="checkbox"/>
11017038E	Patient V	J.J.	PLE	BK	<input checked="" type="checkbox"/>
11017039E	Patient V	J.J.	UR	BK	<input checked="" type="checkbox"/>
11017051E	Patient W	D.	PLE	BK	<input checked="" type="checkbox"/>
11017052E	Patient W	D.	UR	BK	<input checked="" type="checkbox"/>

Isolation ID: 62  
Working list number: 1689  
FlowG number: 230  
Date: 22-11-2011  
Add extra sample/control:

nr	Samplnr	Lastname	cDNA
1	11017002E	Patient A	<input type="checkbox"/>
2	11017028E	Patient B	<input type="checkbox"/>
3	11017023E	Patient C	<input type="checkbox"/>
4	11017030E	Patient D	<input type="checkbox"/>
5	11017031E	Patient E	<input type="checkbox"/>
6	11017032E	Patient T	<input type="checkbox"/>
7	11017033E	Patient T	<input type="checkbox"/>
8	11017034E	Patient F	<input type="checkbox"/>
9	11017037E	Patient G	<input type="checkbox"/>
10	11017040E	Patient H	<input type="checkbox"/>
11	11017041E	Patient I	<input type="checkbox"/>
12	11017042E	Patient J	<input type="checkbox"/>
13	11017043E	Patient K	<input type="checkbox"/>
14	11017044E	Patient L	<input type="checkbox"/>
15	11017045E	Patient M	<input type="checkbox"/>
16	11017046E	Patient N	<input type="checkbox"/>
17	11017047E	Patient O	<input type="checkbox"/>
18	11017049E	Patient P	<input type="checkbox"/>
19	11017050E	Patient Q	<input type="checkbox"/>
20	11017054E	Patient R	<input type="checkbox"/>
21	11017055E	Patient S	<input type="checkbox"/>
22	nac		<input checked="" type="checkbox"/>
23	CMV/EBV PL	batch 8	<input type="checkbox"/>
24	CMV/EBV PH	batch 8	<input type="checkbox"/>
25	JC/BK PL	batch 1	<input type="checkbox"/>

export isolation

export QIagility

Unique samples: 8  
Unique isolations: 8

Total isolations: 26

Werklijst importeren voltooid.

(c) 2011 LABHELP

Work list data

Isolation, cDNA and assay setup

# FlowG – Result analysis module

The screenshot displays the FlowG software interface with the following components:

- Navigation Bar:** Isolation, Analysis, Controls, Assays, Quit.
- Flow number:** 4573
- Working list name:** PCR\_HERPES\_2196\_JOB-PCR\_CBK\_1273\_JOB-PCR\_B19HHV6-8\_850\_JOB
- Controls Table:**

Well	Sample	Detector	CtValue	Threshold	Batch/C_C	Remz
C10	CMV/EBV FH	CMV	27,01	0,04	batch 1126,3	
C12	B19/HHV6/HHV8/IC	HHV6	29,24	0,04	batch 829,64	
C8	nac	CMV	0,00	0,04		
C9	CMV/EBV PL	CMV	32,35	0,04	batch 1132,61	
D1	nac	HHV6	0,00	0,04		
- Inhibited Samples Table:**

Well	Sample	Detector	CtValue
H3	12019747E	PHHV (CY5)herp	31,75
- Approved samples Table:**

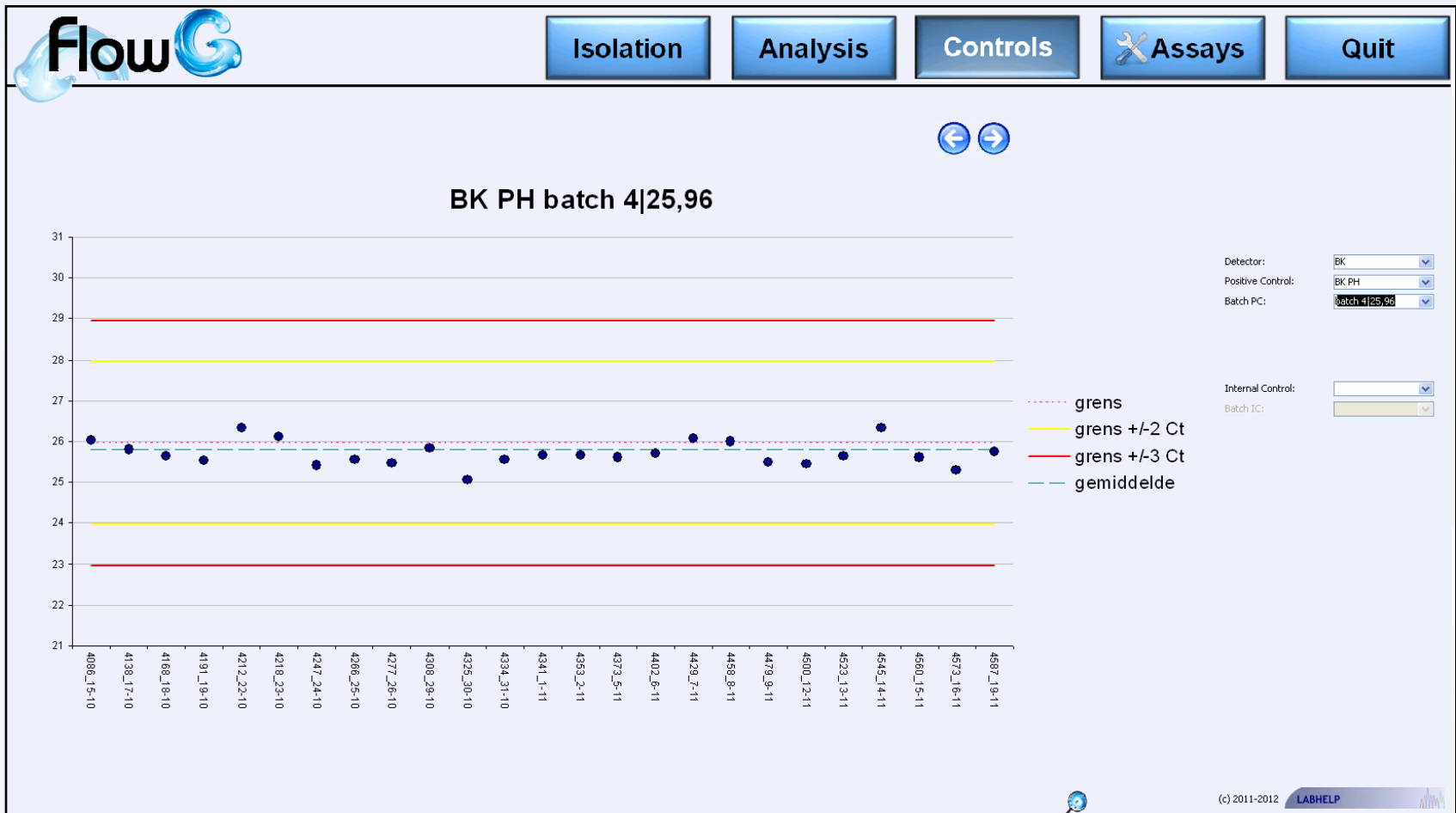
Well	Sample	Detector	Materiaal	CtValue	toISMED	Result	Result_kwant	Remarks
E11	12019786E	EBV	BL	36,10	✓	Postief	947	
A4	12019756E	CMV	BL	31,73	✓	Postief	4290	
C4	12019818E	CMV	BL	40,76	✓	Postief	<100	FlowG.resultkw_oud:17
B9	12019789E	CMV	BL	40,11	✓	Postief	<100	FlowG.resultkw_oud:26
E9	12019778E	EBV	BL	37,25	✓	Postief	441	
D10	12019757E	EBV	BL	35,44	✓	Postief	1470	
B5	12019778E	CMV	BL	41,73	✓	Postief	<100	FlowG.resultkw_oud:10
A8	12019762E	CMV	BL	37,51	✓	Postief	126	
D4	12019747E	B19	BI0PT	21,25	✓	Over	21	
E6	12019773E	EBV	BL	0,00	✓	Neg	<100	
B3	12019775E	CMV	BL	0,00	✓	Neg	<100	
E5	12019772E	EBV	BL	0,00	✓	Neg	<100	
E2	12019764E	EBV	BL	0,00	✓	Neg	<100	
E1	12019763E	EBV	BL	0,00	✓	Neg	<100	
D12	12019762E	EBV	BL	0,00	✓	Neg	<100	
E7	12019775E	EBV	BL	0,00	✓	Neg	<100	
- Other results (not on workinglist) Table:**

Well	Sample	Detector	CtValue	Filename
C7	12019822E	CMV	0,00	Herpes 2196 161112 zonder BK illi.sds
C6	12019821E	CMV	0,00	Herpes 2196 161112 zonder BK illi.sds
C5	12019820E	CMV	0,00	Herpes 2196 161112 zonder BK illi.sds
B10	12019790E	CMV	0,00	Herpes 2196 161112 zonder BK illi.sds
B4	12019776E	CMV	0,00	Herpes 2196 161112 zonder BK illi.sds
B2	12019773E	CMV	0,00	Herpes 2196 161112 zonder BK illi.sds
- Graphs:**
  - Top Graph:** Ct value plot for sample B19. The y-axis is logarithmic (0,001 to 10) and the x-axis is cycle number (1 to 45). The curve shows a typical sigmoidal amplification pattern.
  - Bottom Graph:** Amplification plot showing FAM (red), ROX (black), and TAMRA (grey) channels. The y-axis is fluorescence intensity (0 to 5,000,000) and the x-axis is cycle number (1 to 45). The FAM channel shows a clear amplification curve.

Ct values, qualitative and quantitative results

Amplification- and multicomponent plot

# FlowG – Controls module





# Current status FlowG

- ✓ 2 years in production
- ✓ Validated according to GAMP5 guidelines
- ✓ Interesting key numbers (Poster)
- ✓ Mail/SMS module
- ✓ FilmArray connectivity



# Status

Dear Prof. Niesters, FilmArray 2 detected Influenza A, Influenza A/H1 in sample E2013100465



**FlowG**

Recent POC samples

E2013100465
E2013100237
E2013100224
E2013100134
E2013100132
P2013134002

**Properties**

sample ID	E2013100465
Pouch type	Respiratory Panel IVD v1.6
Instrument	ITI FA \FA2059\
Serial number	413794
Lot number	115612
Protocol	NPS v2.0
Operator	Fons Klijn (klijnf)
Run status	Complete
Pouch result	Passed
Start Time	16-4-2013 11:33
End Time	16-4-2013 12:36
Final result	Positive: Influenza A, Influenza A/H1
SMS send	16-4-2013 12:36
Send to LIS	16-4-2013 12:36

**Results**

Adenovirus	Negative
Coronavirus HKU1	Negative
Coronavirus NL63	Negative
Coronavirus 229E	Negative
Coronavirus OC43	Negative
Human Metapneumovirus	Negative
Human Rhinovirus/Enterovirus	Negative
<b>Influenza A</b>	<b>Positive</b>
<b>Influenza A/H1</b>	<b>Positive</b>
Influenza A/H3	Negative
Influenza A/H1-2009	Negative
Influenza B	Negative
Parainfluenza Virus 1	Negative
Parainfluenza Virus 2	Negative
Parainfluenza Virus 3	Negative
Parainfluenza Virus 4	Negative
Respiratory Syncytial Virus	Negative
Bordetella pertussis	Negative
Chlamydia pneumoniae	Negative
Mycoplasma pneumoniae	Negative

# Current status middleware

- ✓ FlowG, FlowApP (Apeldoorn), FlowMod (Delft), MDmanager ('s-Hertogenbosch)
- ✓ 3 new projects (Breda, Roosendaal, Lelystad)
- ✓ Cooperation with companies
  - FilmArray – BioFire Diagnostics
  - Piro – Dornier LTF



# Conclusion

Custom made middleware solution:

- ✓ Connectivity
- ✓ Productivity
- ✓ Traceability
- ✓ No transcription errors
- ✓ Flexibility
- ✓ Stability

Connections available	Vendor
ISMED 5 (LIS)	Drucker, Germany
GLIMS (LIS)	MIPS
MICROS (LIS)	Philips
LABOSYS (LIS)	Philips
MOLIS (LIS)	Vision4Health
UNILAB (LIS)*	Siemens
MagnaPure LC32/2.0	Roche
MagnaPure 96	Roche
Cobas4800	Roche
EasyMag	bioMerieux
Qiagility	Qiagen
Starlet	Hamilton
Piro*	Dornier-LTF
LightCycler 480	Roche
ABI7500 SDS 1.4	Life Technologies
ABI7500 SDS 2.0.5*	Life Technologies
MxPro*	Agilent
FilmArray	BioFire Diagnostics
Text message Module(SMS)	LabHelp
E-mail Notification	LabHelp
Connectivity to QCMD*	LabHelp

\*In development



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