

Introduction to API/XML toolkit

Short guide to introduce the main advantages of the use of API/XML toolkit for Andrew



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Version 1

Version	Date	Description	Author
1.0	Nov 26, 2016	First version	Giorgio Horak
1.1	Oct 13, 2017	What is the "API-XML toolkit"? Type of integrations	Giorgio Horak

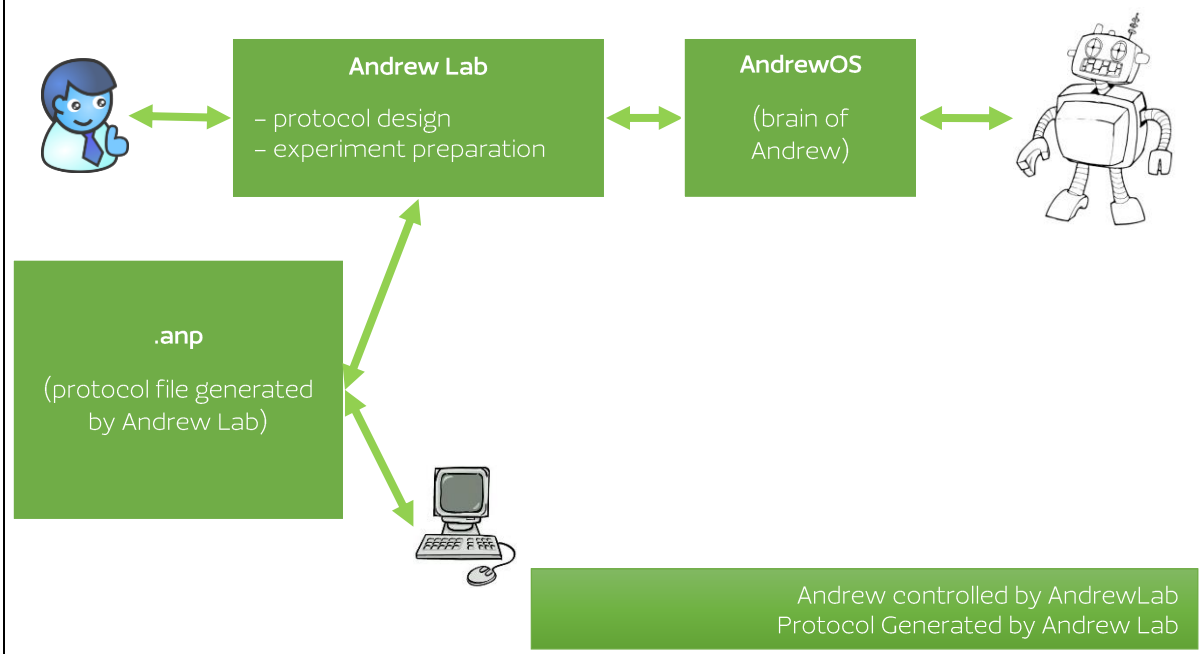
What is the "API-XML toolkit"?

The "API-XML toolkit" is a documentation package with code examples. In particular:

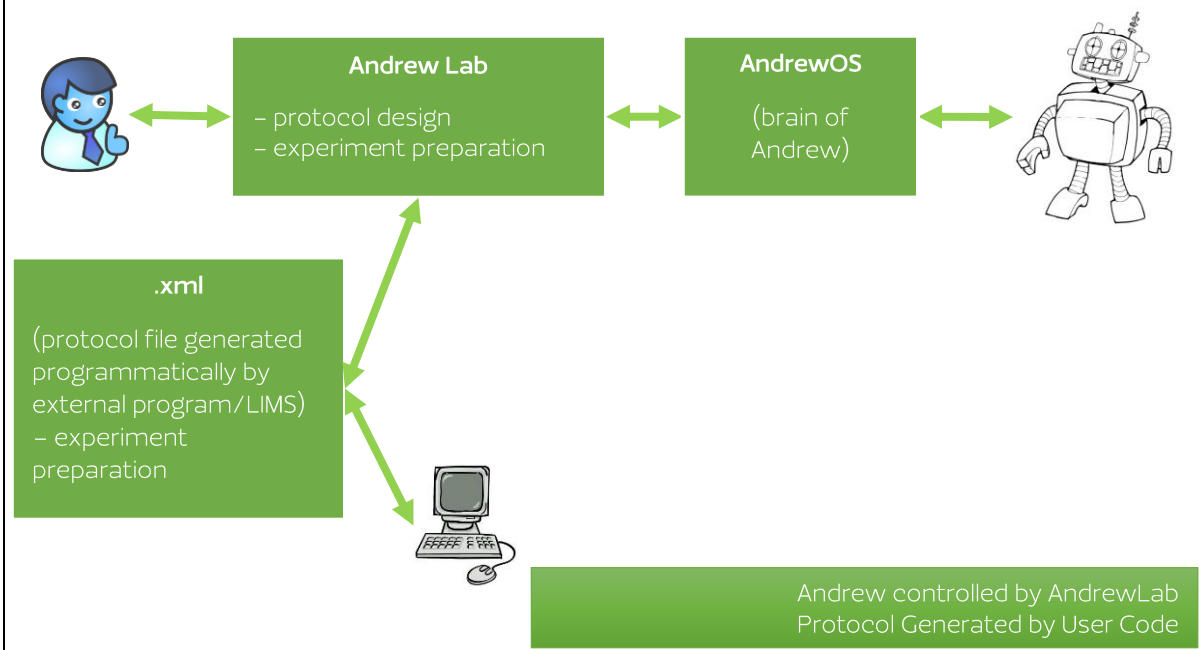
- XML: Computer generation of protocols and consumables
 - Purpose: Create complex protocols programmatically
 - Examples:
 - list of consumables/compounds from LIMS
 - Concentrations from LIMS
 - Dilution factors from LIMS
 - Special procedures/automated protocol variants
- API: External control of Andrew, with or without Andrew Lab
 - Purpose: Control Andrew from other Software
 - Examples:
 - Pause/start/stop
 - Definition of customized deck layouts (experiment preparation)
 - Monitoring and Collection of errors from running protocols
 - Interfacing to other equipment

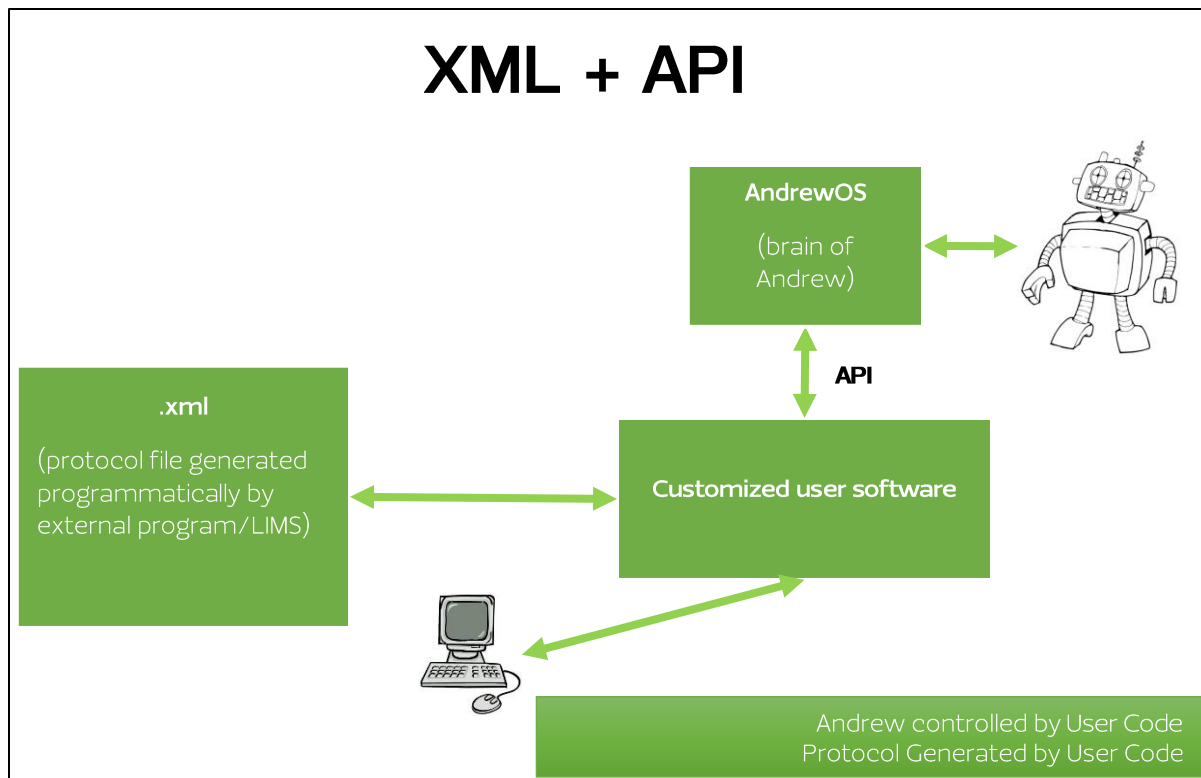
Types of integrations

How Andrew works (Standard mode)



XML ONLY





Requirement

The reader is advised to be familiar with Andrew units as well as Andrew Lab and AndrewOS software, both released by Andrew Alliance.

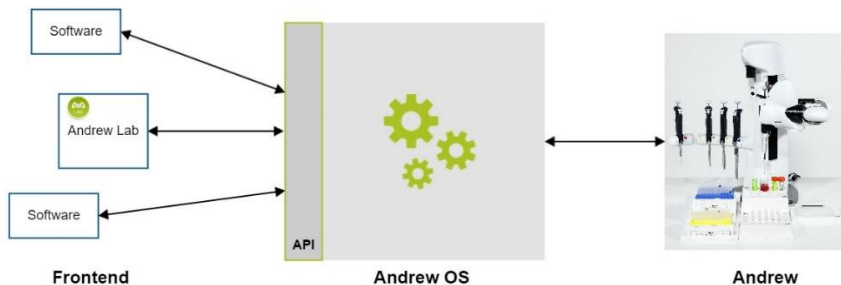
Overview

As you may already know, with Andrew Lab you can:

1. Design and optimize liquid handling protocols
2. Execute experiments with:
 - An Andrew up and running
 - Andrew OS installed

In general, Andrew Lab manages the preparation, monitoring and reporting, while Andrew OS executes, manages data and gives instructions to Andrew.

The XML/API toolkit describes the Application Programming Language (API) to communicate directly to AndrewOS and contains all the information to integrate Andrew into lab informatics platforms such as LIMS, ELNs, and SiLA.



Communication protocol

The communication uses the XML-RPC protocol. It is a remote procedure call (RPC) protocol, which uses XML to encode its call and HTTP as a transport mechanism. For more information regarding the XML-RPC protocol, as well as different libraries for different programming languages, please follow the link: <http://en.wikipedia.org/wiki/XML-RPC#C.2B.2B>



General information

API/XML toolkit is composed of the following parts:

- [ANP protocol](#), which contains all the information to create a protocol which can be edited and execute using Andrew Lab
- [AndrewOS API](#), the brain of Andrew, which allows controlling any Andrew unit
- [XML protocol for AndrewOS](#), which contains all the information in order to design and execute experiments with Andrew directly via AndrewOS and without the use of Andrew Lab

ANP protocol

This documentation presents and describes the structure of the file generate by Andrew Lab when a protocol is created. This structure cannot be provided directly to AndrewOS, but only to Andrew Lab.

General information

The ANP protocol is a xml structure whose main structure is reported below:

```
<?xml version="1.0" encoding="UTF-8"?>
<protocol version="1.4.1">
  <public />
  <data>
    <private />
    <library />
    <stock_solutions />
    <consumables />
  </data>
</protocol>
```

```
<set />  
<actions />  
</data>  
</protocol>
```

For what is used?

The description of the ANP protocol is typically used in order to:

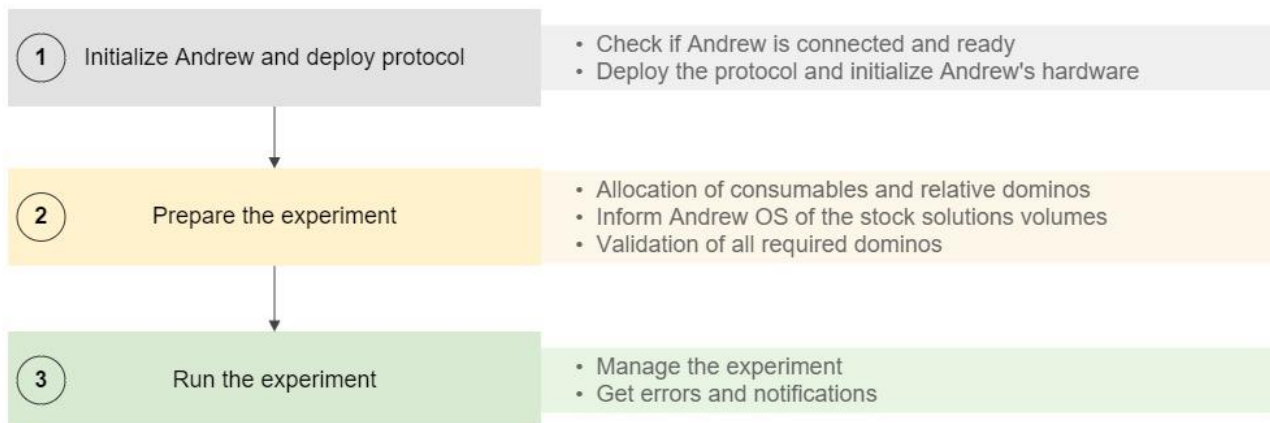
- Programmatically generate .anp protocols which may be successively edited or executed using Andrew Lab
- Modify anp protocol previously generated by Andrew Lab



The anp protocol saved by Andrew Lab are encrypted Andrew Alliance Service&Support team will be glad to decrypt your protocols

AndrewOS API

AndrewOS API allows the full control of Andrew using XML-RPC connection. In particular, to execute an experiment, 3 steps are required:



In [appendix A](#), the whole workflow is shown.

API calls

The available *Andrew OS API* calls (through XML-RPC) are presented into different groups according to their functionality:

API call group	Description	API call
Andrew	To run actions or get any information from Andrew	- Initialize
Protocol	To deploy a protocol or get the current protocol. → Usually called during the initialization and preparation steps	- deployProtocol
Domino	To get or set any information or allocations related to the dominos in the workbench. → Usually called during the preparation step	- getCustomBlocks - getBlockRepartitionPolicies - getDominoInfo - getDominoAllocation - getBlockInfo - sendBlocksRepartition - validateBlock - validateDomino
Experiment	To start, pause, resume (...) an experiment. → Usually called while an experiment is running.	- start - pause - stop - resume - reset - restockSolutionInDomino - restockSolutionInConsumable - getMotorInfo
Error	To get any errors occurred during any actions or calls.	- getErrors

	→ Can be used at any time during the initialization, preparation or execution of an experiment	
Status	To get the status of any step (initialization, preparation, experiment). → Each status should be used in its corresponding step	<ul style="list-style-type: none"> - getAndrewStatus - getPreparationStatus - getActionStatus -

For what is used?

AndrewOS API can be used to:

- Monitor the execution of an experiment
- Pause, resume and stop an experiment
- To have a full integration of Andrew by means of "[XML protocol for AndrewOS](#)"

XML protocol for Andrew OS

Before carrying out an experiment on Andrew through AndrewOS, a protocol needs to be deployed. This protocol contains all the information concerning the required consumables, stock solutions, pipette set and actions required.



Andrew Lab converts the ANP protocol in a XML protocol compatible with AndrewOS

Structure

The XML protocol structure is composed of different parts:

- Information about the protocol file.
- Custom consumables
- Stock solutions
- Consumables
- Pipette set
- List of actions to be run in the experiment

The structure is the following:

```
<?xml version="1.0" encoding="UTF-8"?>
<protocol>
  <properties />
  <library />
  <stock_solutions />
  <consumables />
  <set />
  <actions />
</protocol>
```


For what is used?

The use of "XML protocol of AndrewOS" is useful in case of integration of Andrew into lab informatics platforms. By means of AndrewOS API, it is possible to send directly protocol to be executed by Andrew without the use of Andrew Lab.

"XML protocol of AndrewOS" is particularly useful in case of application which requires a template protocol which must be frequently edited and updated.

Contact

For more information about how *Andrew Lab* and the *XML/API toolkits* can address your lab automation needs, contact us at

Andrew Alliance Service&Support: support@andrewalliance.com

Appendix

