Environmental Sample Processor Mission Scripting

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Mission Scripts and Phases

- Top Level Commands for a deployment
  - Often omitted for lab work
- Usually contains a mission method
  - Specifies the starting tube number
  - Optionally specifies Mission End Time
  - Contains any number of mission phases
    - Each having a start time
      - with optional trigger conditons
    - One or more protocols run per phase
  - The ESP sleeps between phases
    - Contextual sensors continue being polled

Protocols

- Protocol scripts do the real work of microbiological assays
  - Many canned scripts available:
    - hab = Harmful Agal Bloom
    - bac = Bacterial Assay
    - larv = Larval Assay
    - wcr = Whole Cell Archival
    - da = Domoic Acid Assay
    - habda = combined HAB and DA assay
    - stx = Saxitoxin Assay
  - All have parameters you may modify to suit your needs
    - With default values so you needn't specify everything
  - You may also create new protocols using the existing protocols as a guide

Example “3peat” QC Mission

```
mission  startTube: 2,  endTime:  “6AM 12/18/12”  do

  at "12:40:00 12/14/12" do
   habda {noKill}
  end

  at "12:40:00 12/15/12" do
   habda {noKill}
  end

  at "04:00:00 12/17/12" do
   habda
  end

end
```

Example Mission (1 of 3)

```
# Top level ESP Mission script for July 2017 Niagara deployment  – niagara17jul11_V2.rb
$daVol = 1000     #5.0um durapore

$da[:wcrVol]=1000 #default to 1L wcr for da
$startTime="+2 days"   #relative to start of last phase – not its end time!
$numPhases = 0  #Deployment count of phases run

def nextTime startTime=$startTime
    #if a relative time is specified, reference the start of the
    #previous phase instead of the current time
    Delay.wakeTime startTime, $started
end
nextStartTime = method :nextTime

def logPhaseStart phaseKind
  log=Thread.log
  log.synchronize {
      log.forceDateOut
      log.record "===>  STARTED #{phaseKind} (phase ##{$numPhases+=1})  <==="
  }
end
```

Example Mission (2 of 3)

```
def withoutWCR
  [$daVol, nil]
end

def twoDAs
  logPhaseStart :twoDAs
  Sample.shallow; initialPurge; da withoutWCR
  Sample.deep; initialPurge; da withoutWCR
end

fill! if ESP.simulation?  #simulate full puck load
```

Example Mission (3 of 3)

```
mission :startTube=>2 do
  at "4PM 7/17/2017" do
    Sample.shallow; initialPurge; da withoutWCR
  end
  at "10AM 7/19" do
     Sample.shallow; initialPurge; da withoutWCR
  end
 3.times {
   at nextTime do
       Sample.shallow; initialPurge; da withoutWCR
   end
  }
  3.times {
    at nextTime '10AM' do
        twoDAs
    end
  }
  15.times {
      at nextTime do
          twoDAs
      end
  }
end
```

Running Late

- When the phase start time has already past
  - `Delay::MaxLate` determines whether
    - to throw a TooLate Exception, or
    - to continue with a running late warning
    - defaults to 1.hours

      -> `Delay.adjust :MaxLate, 2.hours`

- To limit the longest delay to start next phase

  -> `Delay.adjust :MaxWait, 2.weeks`
  - MaxWait defaults to nil
    - which allows mission phases to wait forever

Alternate Framework for daily repeating phases

- Schedule is an array of daily start times
  - rather than being coded in Ruby mission script
- Assumes next day is like the present one
- Assumes startTube already initialized
- Does not start and stop contextual sensors
- Every phase must process the same number of pucks
- Easy to skip weeks or months
  - combersome if every day is different
- It’s easy alter schedule from an espclient
  - without aborting the running mission
- Mission runs until all but a set number of pucks processed
  - conserves these for controls

Example Daily Mission

```
require ‘daily’  #use alternate “daily” mission framework
Daily.mission 8, 4, [  #reserve 8 pucks, process 4 at a time
   "2/7/23".daily("9AM","3PM","11PM"),
   "2/8".daily("rise + 3", "set + 2:15:00"),
   "2/12".daily,
  "2/15".daily("9:14", "19:59")
] do |startTime, remainingPucks|
   at startTime do
      initialPurge; bac
   end
end
```

- In English: while more than 8 pucks remain,
  - 3 bac phases each day on 2/7/23
  - 2 bac phases each day from 2/8 through 2/11
  - sleep from 2/12 through 2/14 #vacation :-)
  - 2 bac phases each day from 2/15