NRL Workflow &= Worklets

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Overview

- {y.a.} Introduction to the MLS workflow system from Naval Research Labs.
- Introduction to PSL's Worklets system
- Wish list for the NRL system, and what the Worklets system can provide.
- Level of progress
- Future directions
- Conclusion

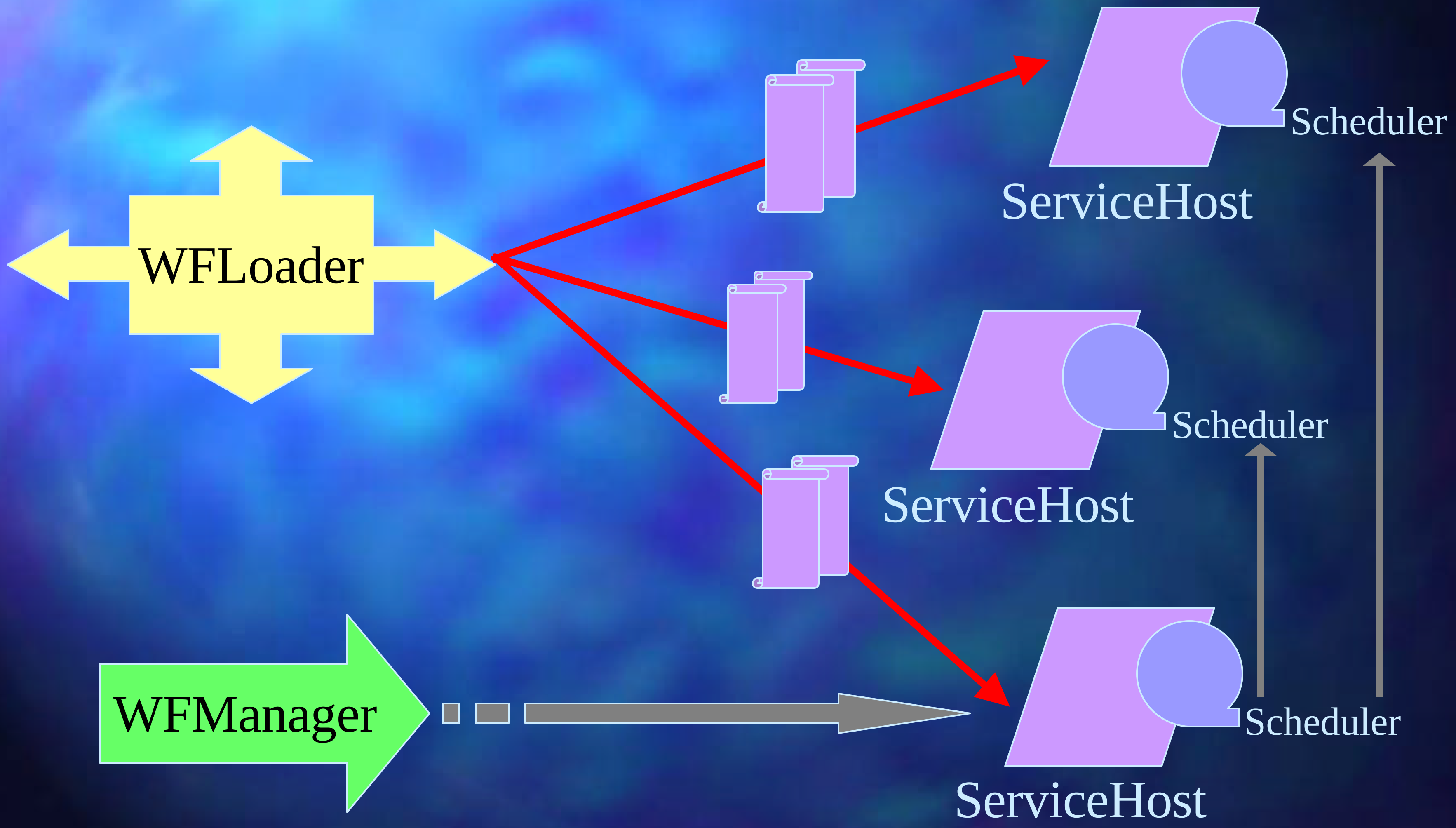
The NRL system

- Multi-level security constraints prohibit “write down” of messages, meaning that information never flows from a higher security level to a lower one, and control only flows in the opposite direction.
- The NRL workflow designer ‘splits’ a workflow spanning multiple security levels into individual independent workflows, each completely bounded by a single security domain.
- Special “sync” tasks handle the transition of data and the flow of control between domains.

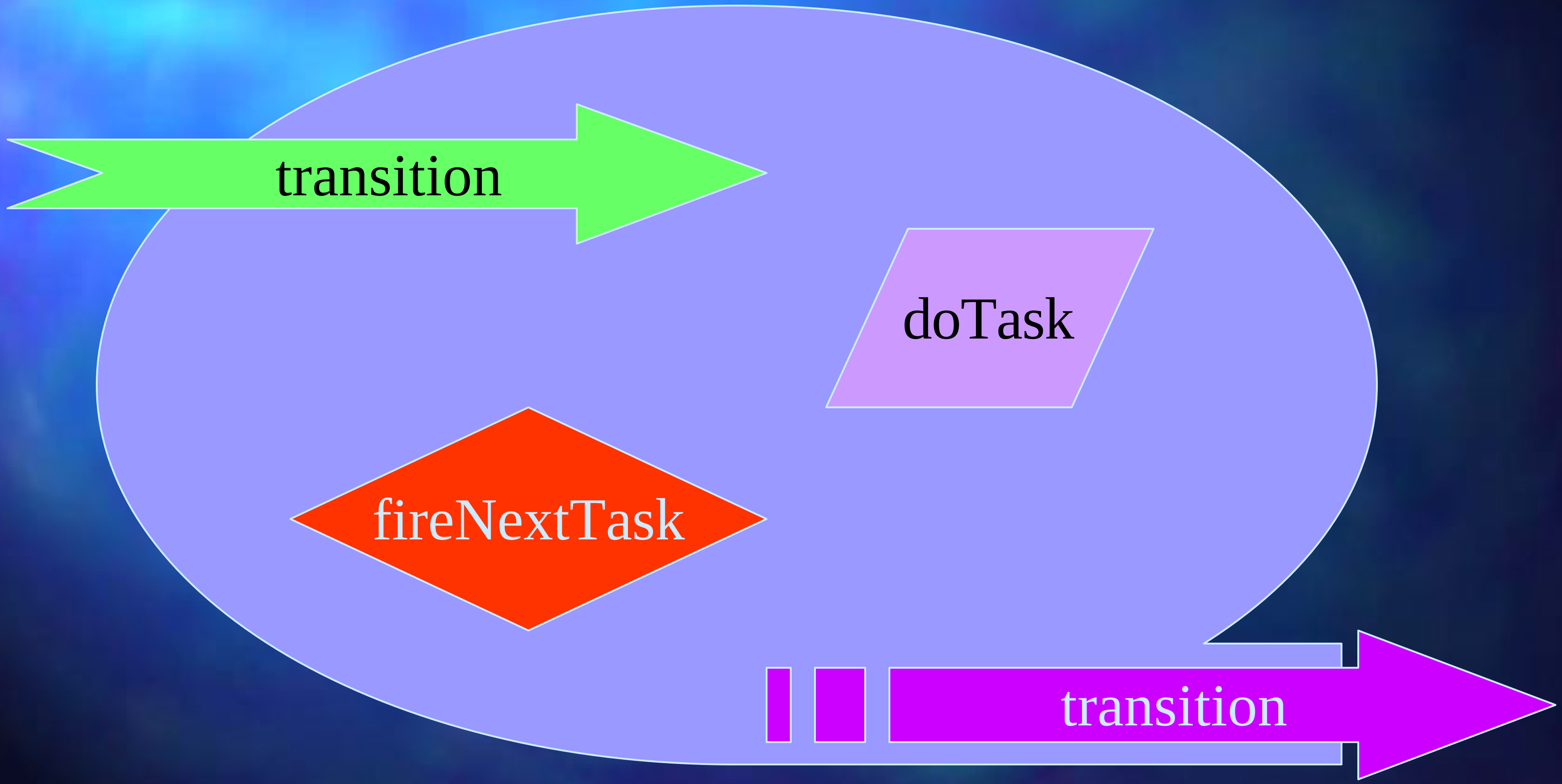
Design and Run

- Decoupled workflow designer and runtime
- 3 kinds of simple tasks – human, transactional, non-transactional.
- Network task – abstraction for an aggregation of tasks in the designer; at runtime, the aggregate has its own controller that is delegated the responsibility for completion of the network task.

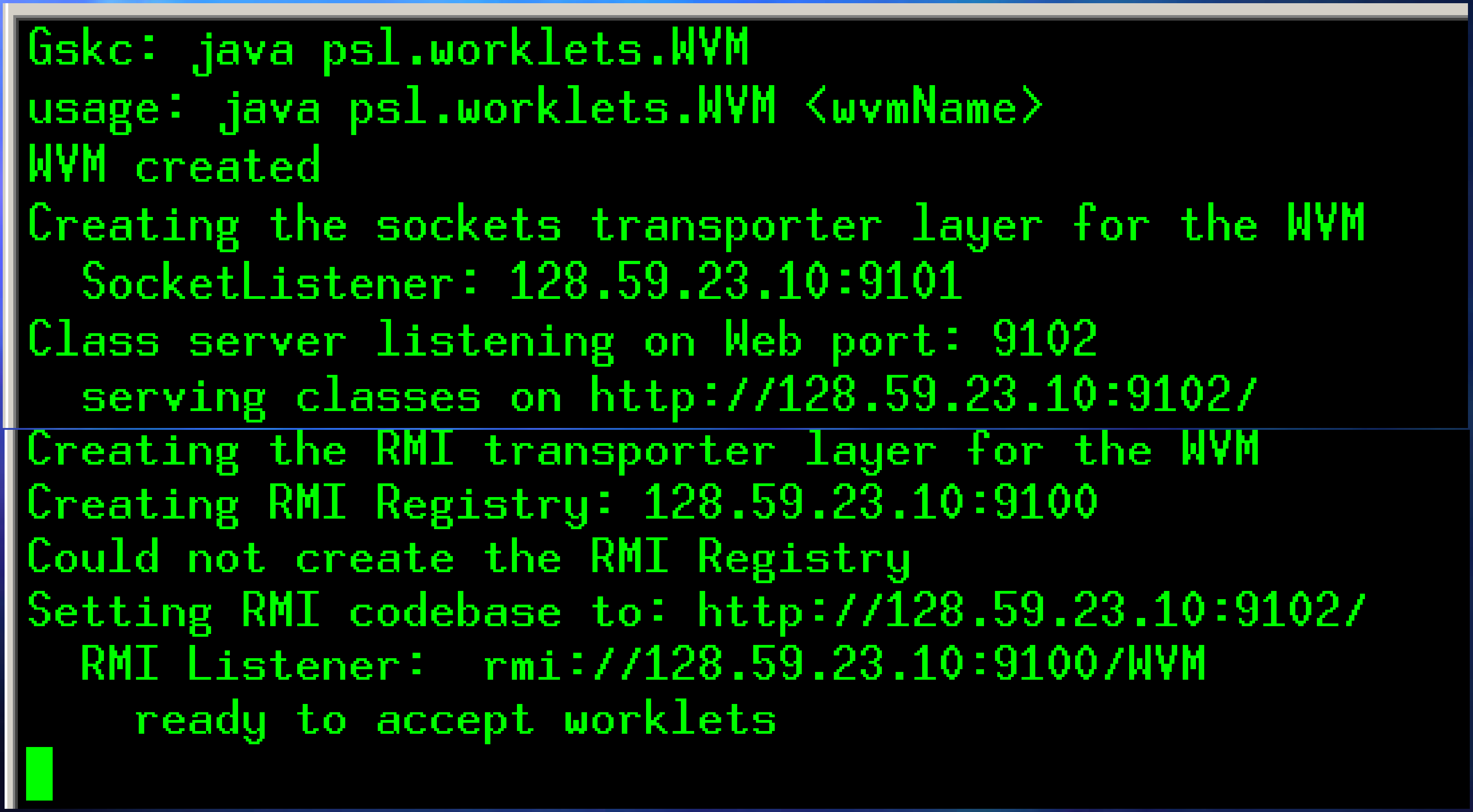
The runtime components



Inside the scheduler



Worklets, WorkletJunctions



```
Gskc: java psl.worklets.WVM
usage: java psl.worklets.WVM <wvmName>
WVM created
Creating the sockets transporter layer for the WVM
  SocketListener: 128.59.23.10:9101
Class server listening on Web port: 9102
  serving classes on http://128.59.23.10:9102/
Creating the RMI transporter layer for the WVM
Creating RMI Registry: 128.59.23.10:9100
Could not create the RMI Registry
Setting RMI codebase to: http://128.59.23.10:9102/
  RMI Listener:  rmi://128.59.23.10:9100/WVM
    ready to accept worklets
```

Survivability ???

- Survivability is the result of training readiness, state-of-the-art equipment, sound leadership, and informed decision making in the face of hazards that we have not created, don't fully control, and can't walk away from.
  - *http://www.safety-ndi.navy.mil/*
- Survivability is the ability of a network computing system to provide essential services in the presence of attacks and failures, and recover full services in a timely manner.
  - *http://www.cert.org/nav/index_purple.html*

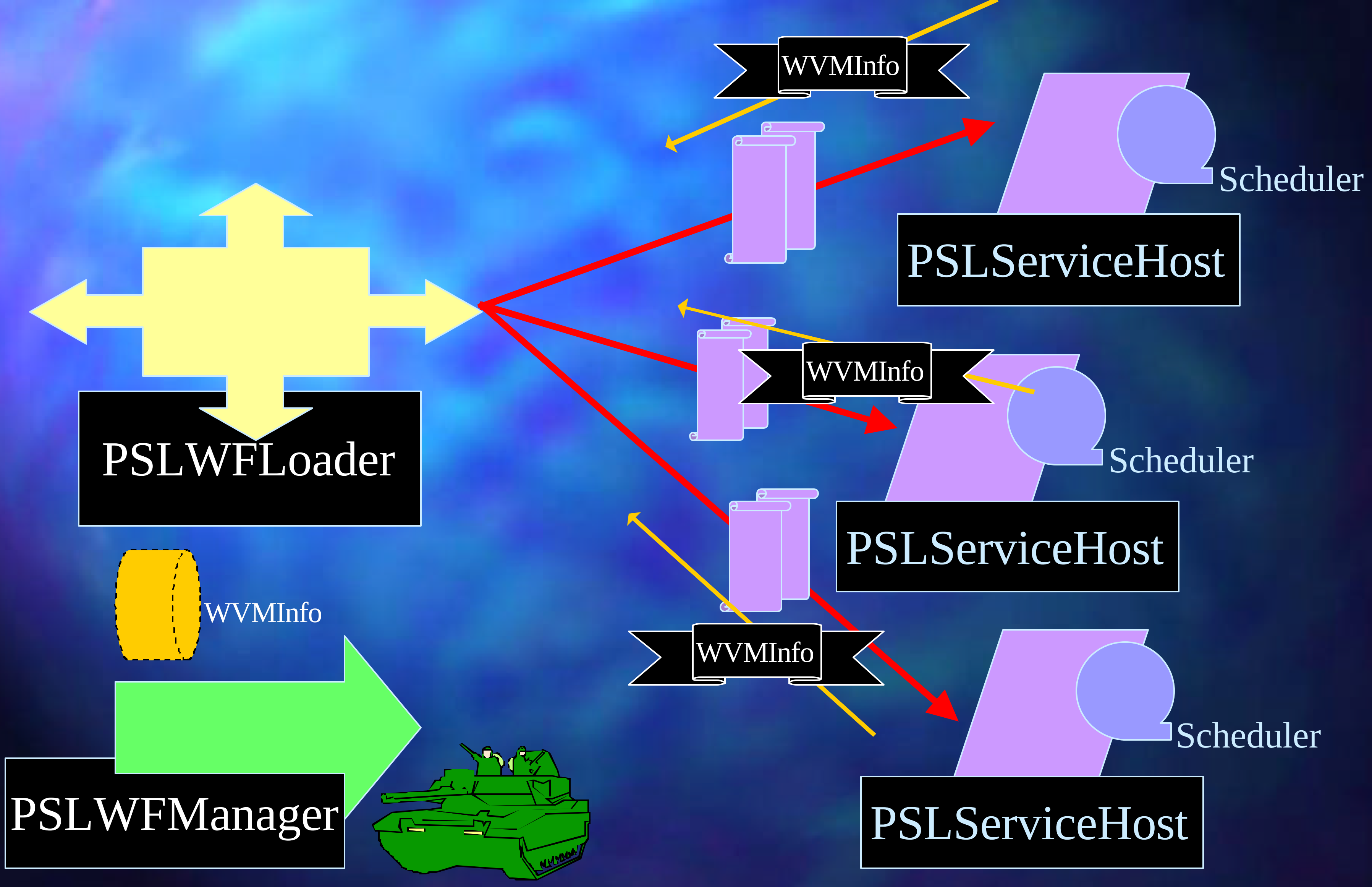
Survivability ???

- Our [evolving] interpretation:
  - A distributed software system is survivable when failure of individual components does not cause the whole system to fail.
  - A trivial solution would be to provide “enough” backup components so that there would be no individual task that cannot be executed.
  - A more comprehensive approach will find out which tasks to be undo/redo, how to restore lost data, which replacement task to run, etc.

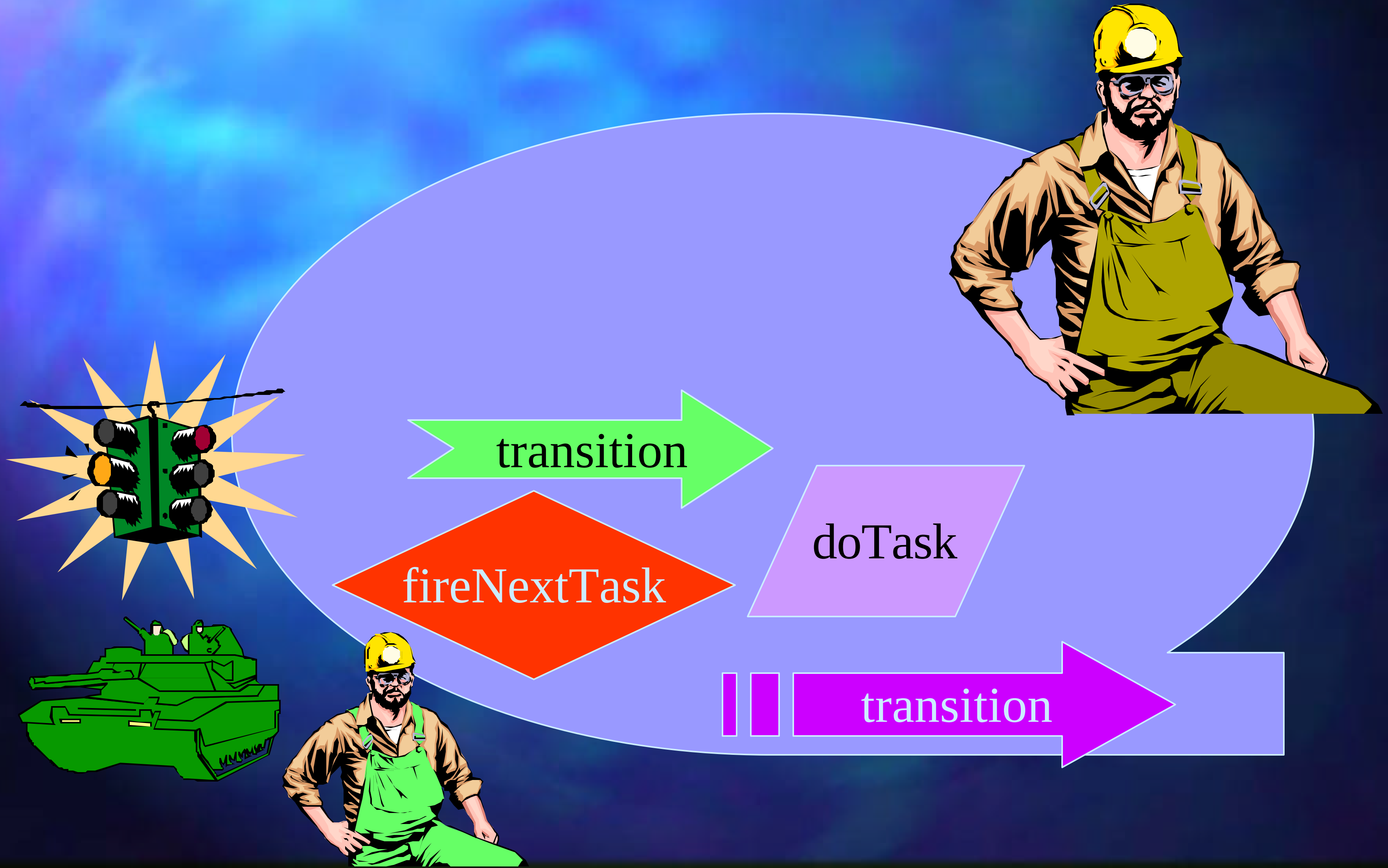
Survivable workflow, but how?

- *SurvivorNG*: applying dynamic adaptation to the whole workflow by using Worklets to figure out alternative routes among surviving nodes.
- If the next task can be executed, then where can this be done? How do you know if the next task can be executed at all or not?
- At a finer level of granularity, when partially completed tasks fail, which is the way to go? If re-doing, can we still get the results of the predecessor task, is it still alive?

What we added ...



Inside PSLScheduler



transition

fireNextTask

doTask

transition

a demonstration ...

Future Directions

- *SurvivorNG* is a very young project, need at least:
  - A programmatic way of specifying alternative task processors, and their capabilities through an editor
  - Mutual awareness among task processors at runtime – this will lead on to dynamic service discovery capabilities of the system
- More short-term plans are:
  - Modeling parallel routes by cloning/merging Worklets
  - Recoverability from mid-process execution, when the Worklet's current site goes down
  - Survivable loader/manager as a 'distributed' process

Conclusion

- Newer applications for Worklets keep coming out!!
- Extension of the NRL system with minimally invasive modifications.
- We enable a situation where we can entrust the survivability of a workflow to an “James Bond”-like entity, the autonomous mobile agent – is this the Survivor-007 system?