

# ***Adding High Availability to Condor Central Manager***

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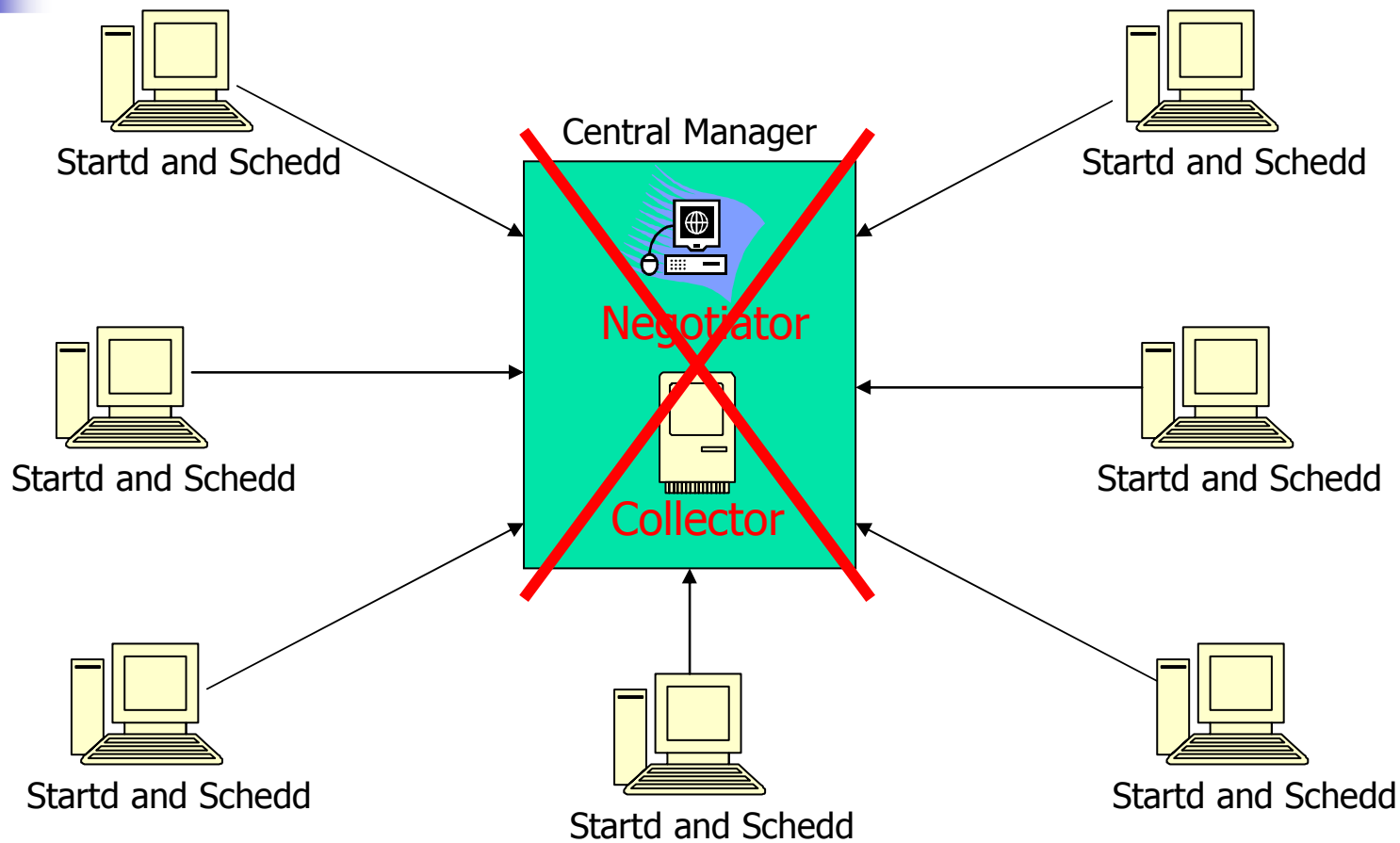


# Outline

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- Current Condor pool
- Motivation for Highly Available Central Manager
- The solution - HA Daemon
- Performance impacts
- Testing
- Future Work

# Current Condor Pool



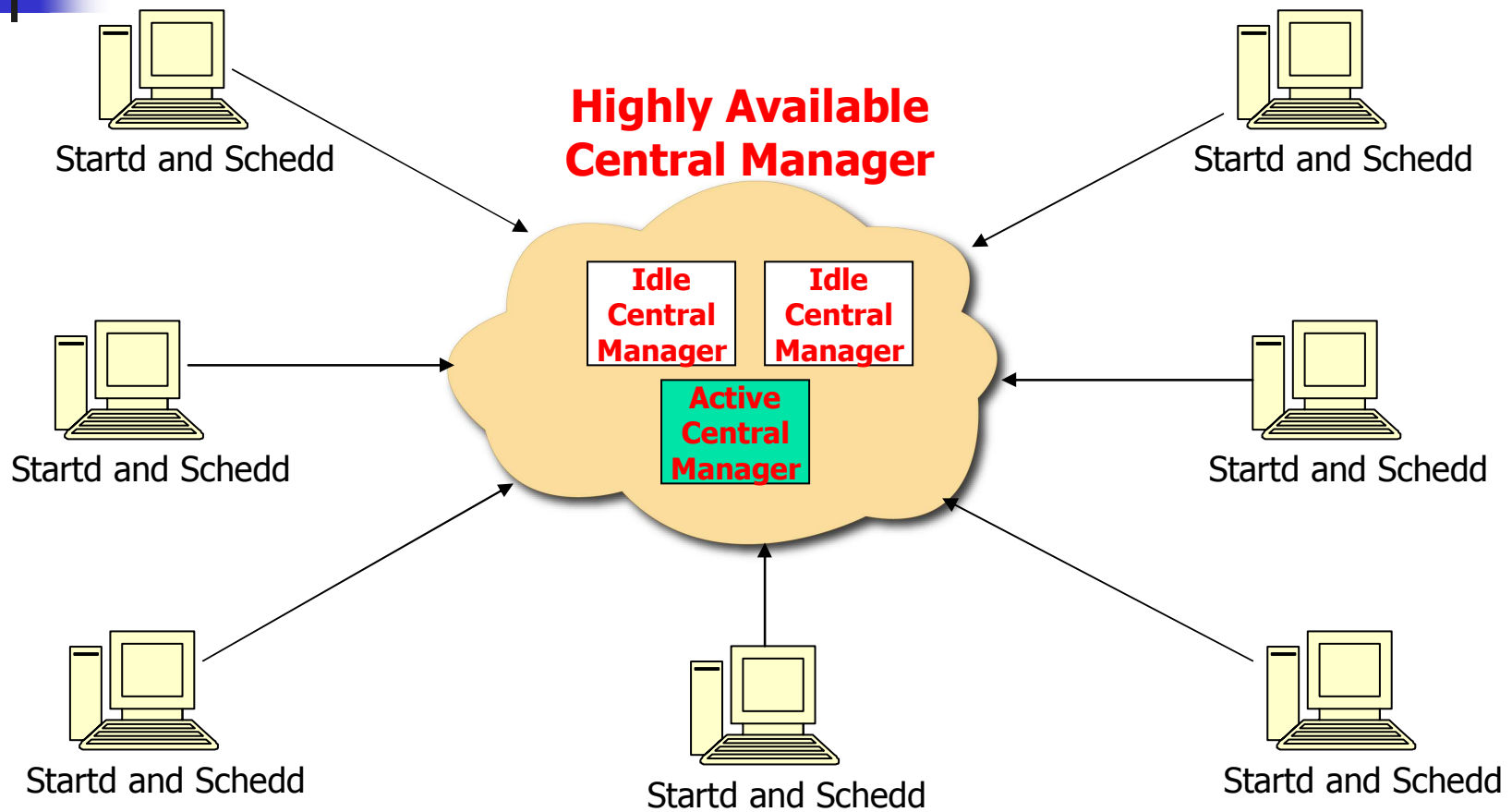


# Why Highly Available Central Manager

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- Central manager is a **single-point-of-failure**
  - Negotiator's failure - No additional matches will be possible
  - Collector's failure – negotiator is out of job, tools querying collector won't work, etc.
- Our goal
  - Allow **continuous pool functioning** in case of failure

# Highly Available Condor Pool





# Highly Available Central Manager

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- Our solution - Highly Available Central Manager
  - **Automatic** failure detection
  - **Transparent** failover to backup matchmaker (no global configuration change for the pool entities)
  - **“Split brain” reconciliation** after network partitions
  - **State replication** between active and backups
  - No changes to Negotiator/Collector code



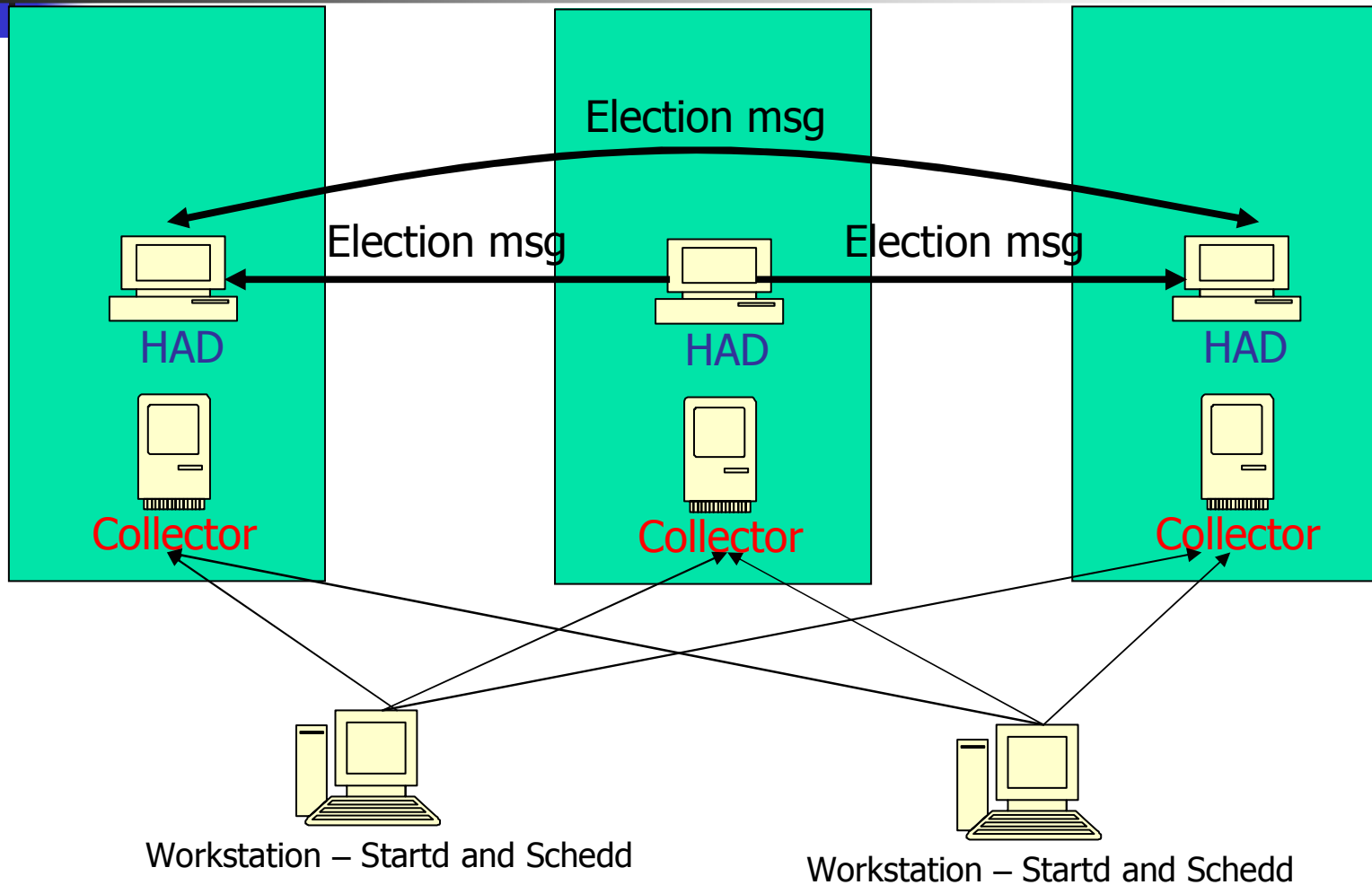
# Highly Available Central Manager

## How it works

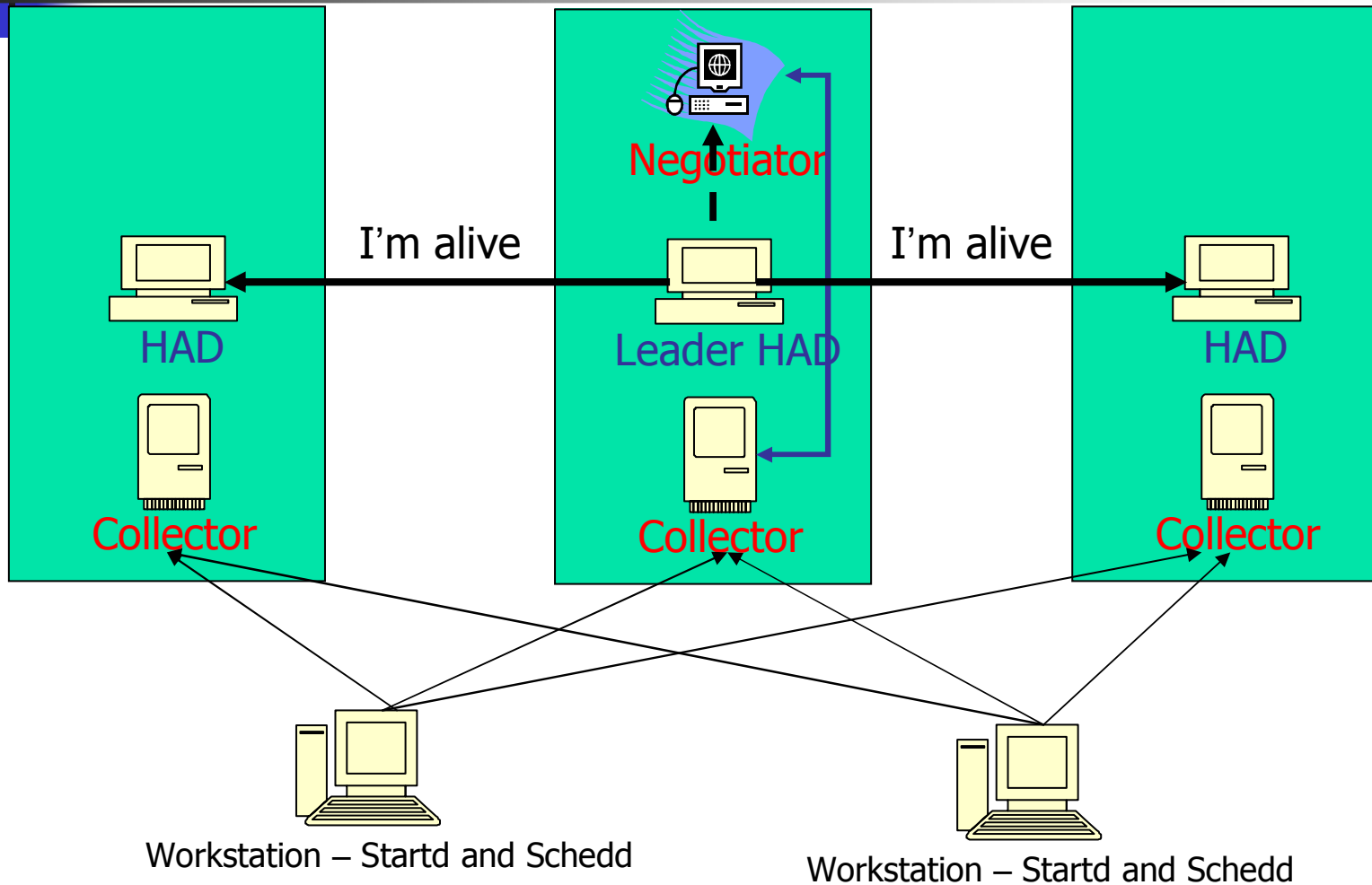
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- Collector's HA is provided by **redundancy**
- Negotiator's HA is provided by **HA daemons**

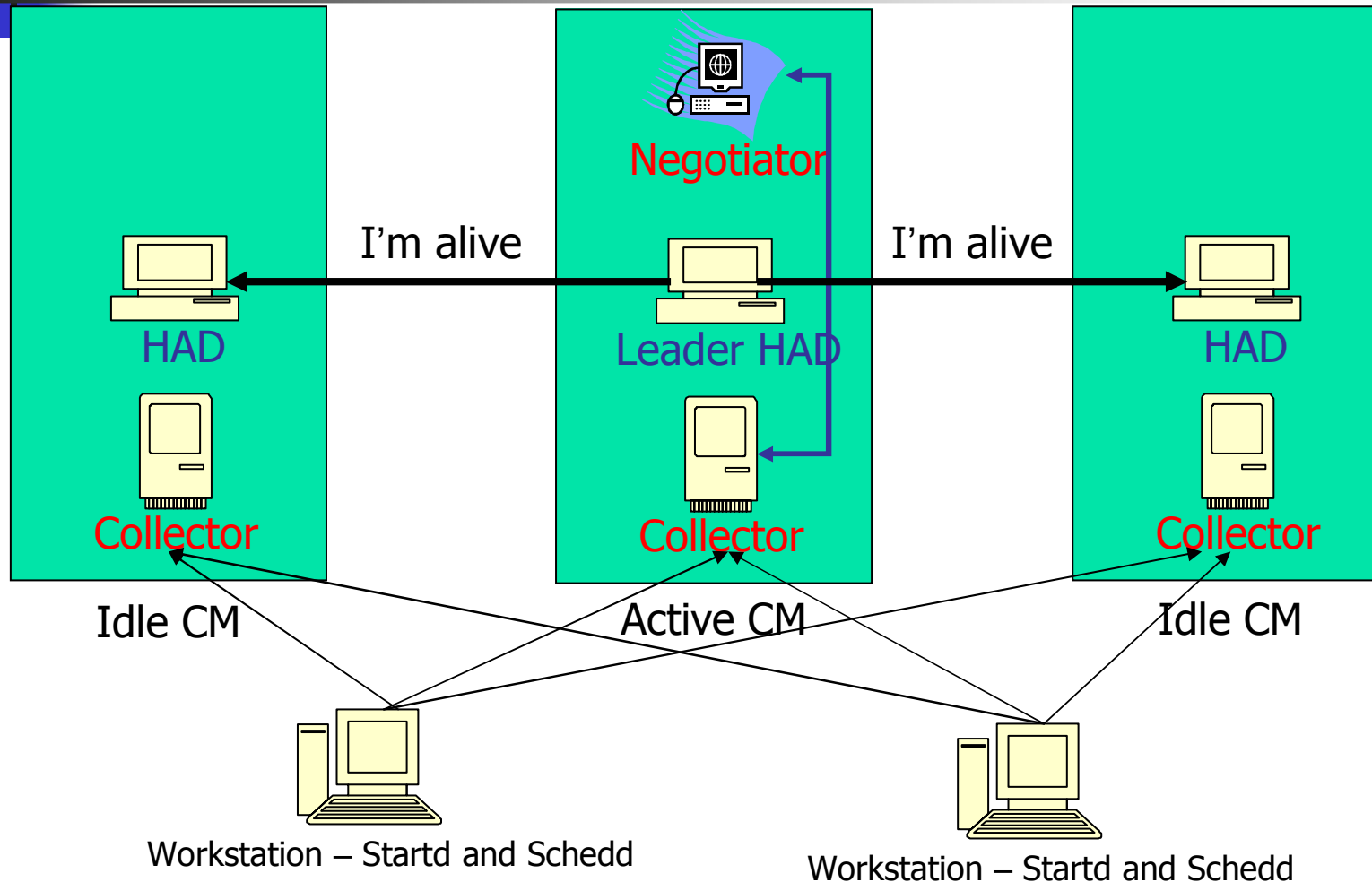
# How it works – Election



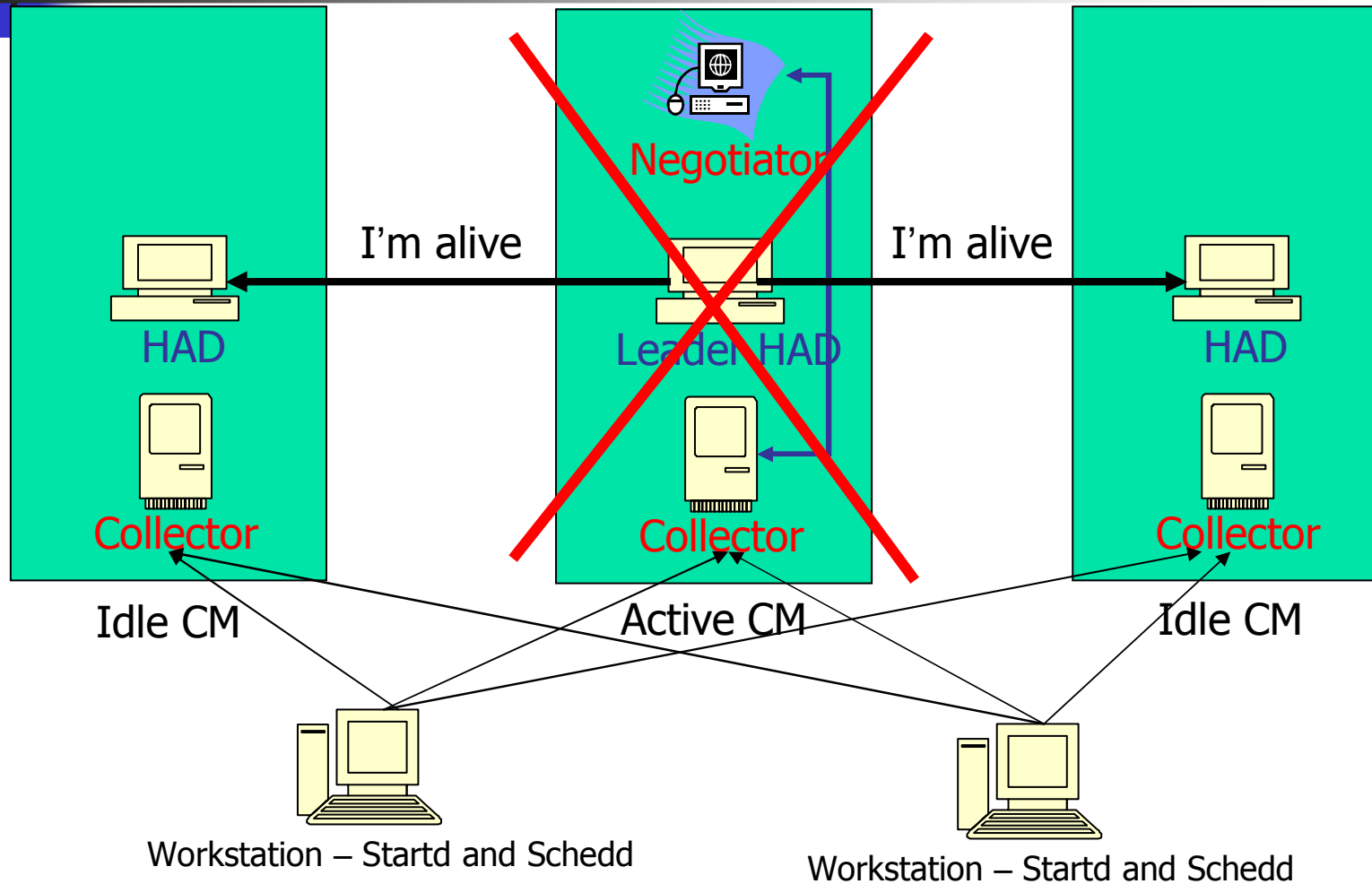
# How it works – Election



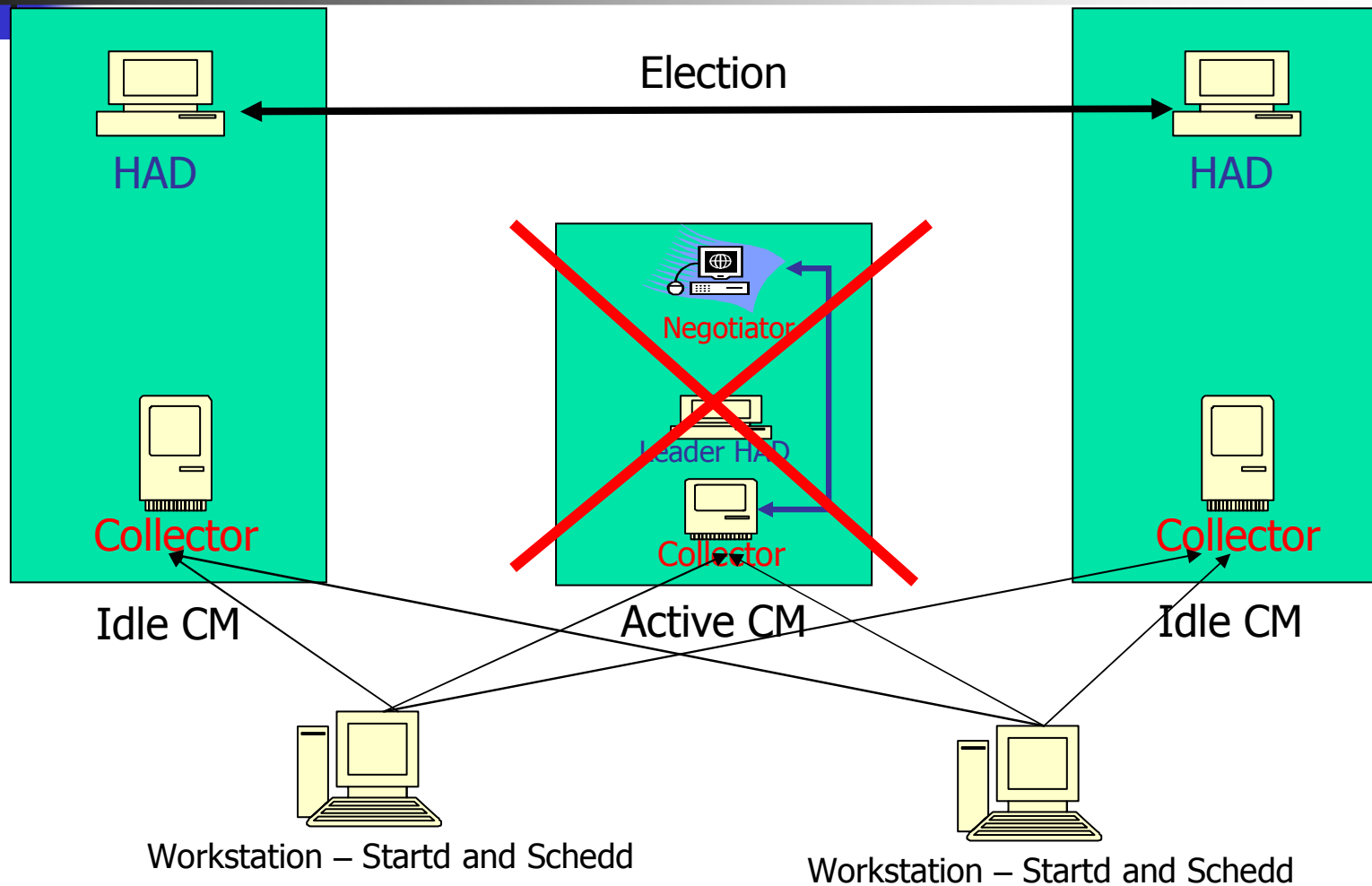
# How it works – basic scenario



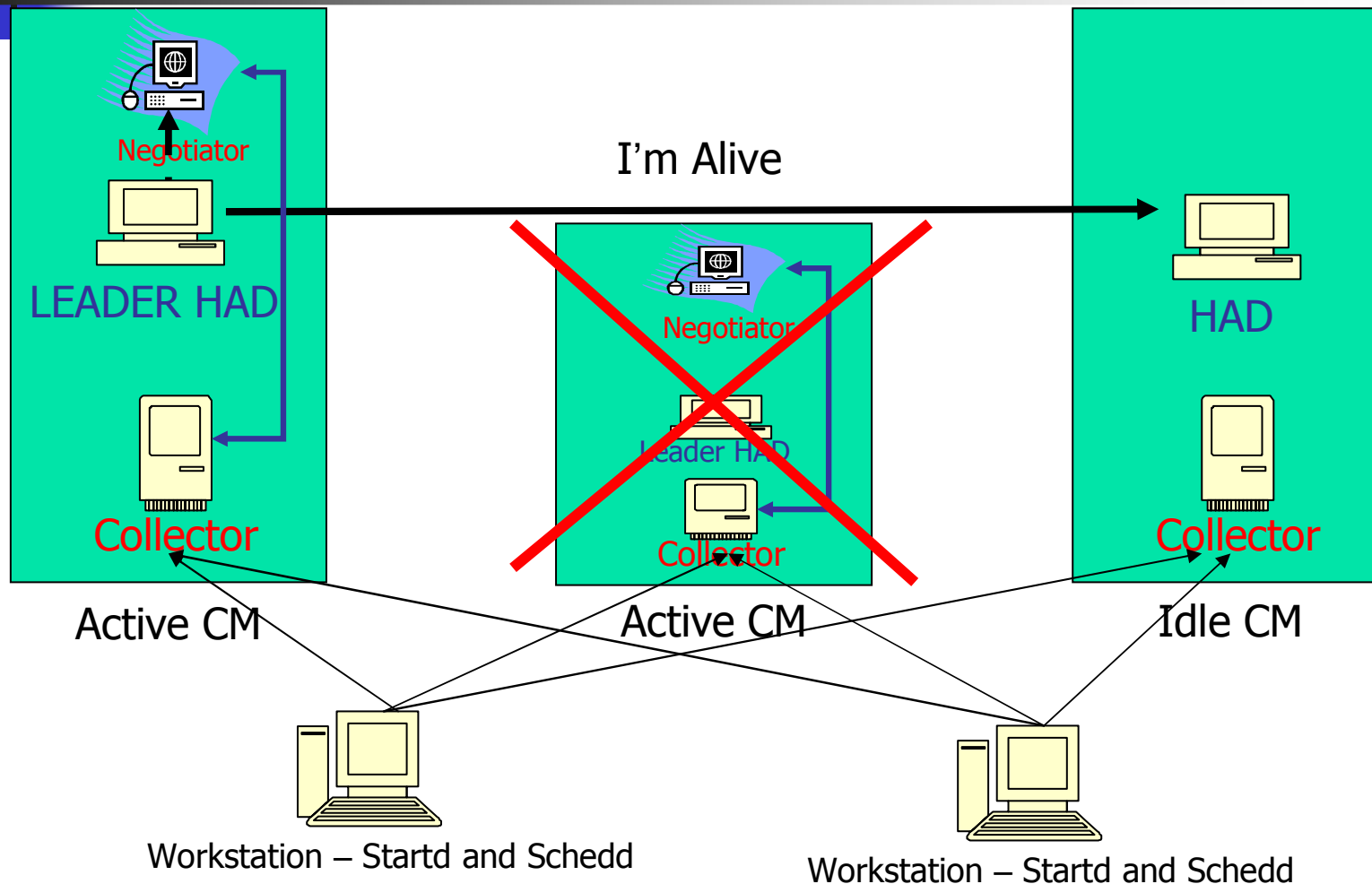
# How it works – crash event



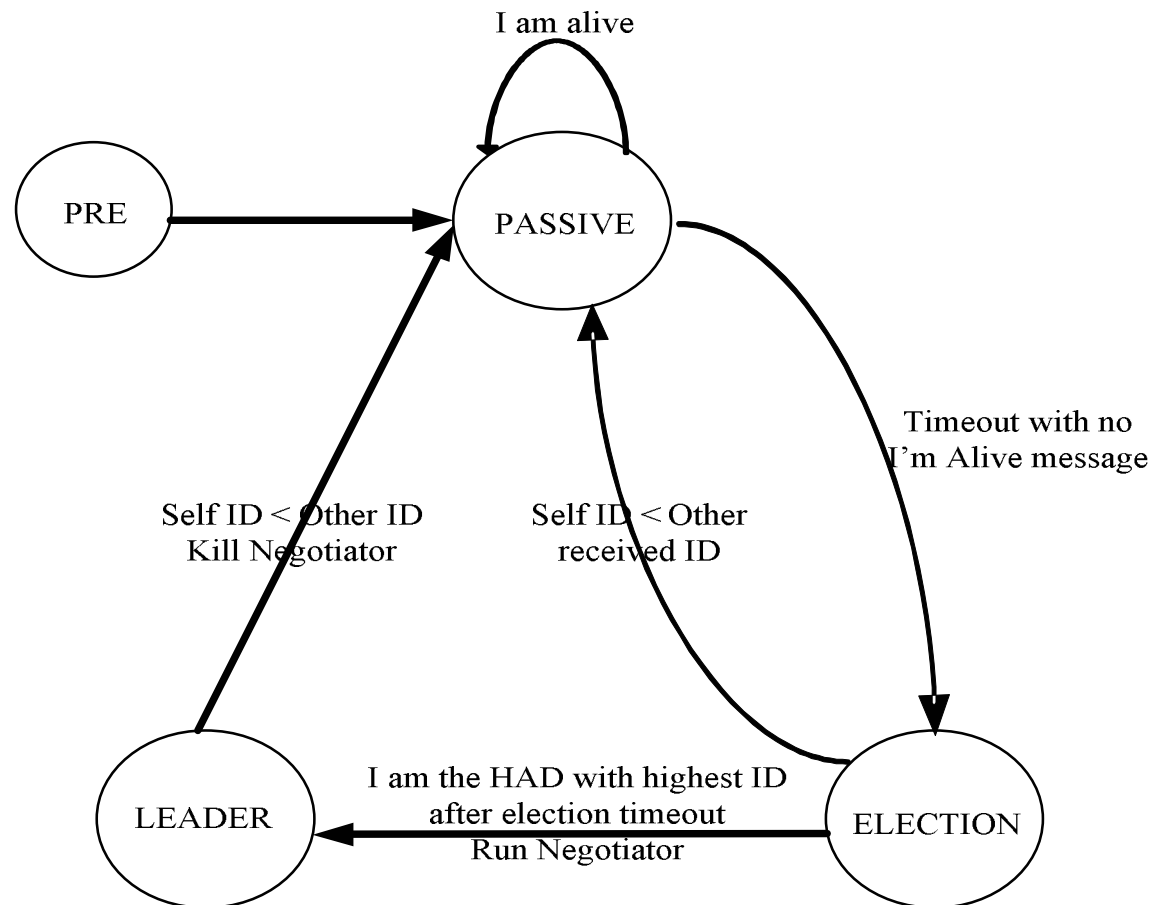
# How it works – crash event



# How it works – crash event



# High Availability Daemon State machine





# Performance impact

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- **Stabilization time** – the time it takes for HA daemons to detect failure and fix it
- Depends on number of CMs and network performance
- HAD\_CONNECT\_TIMEOUT – time it takes to establish TCP connection (depends on network type, presence of encryption, etc...)
- Assuming it takes up to 2 seconds to establish TCP connection and 2 CMs are used - new Negotiator is up and running after **48** seconds



# Testing

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- Special **automatic distributed testing framework** was built:
  - simulation of node crashes
  - network disconnections
  - network partition and merges
- **Extensive testing** effort:
  - distributed testing on 5 linux machines in the Technion
  - interactive distributed testing in Wisc pool
  - automatic testing with NMI framework
- Already **deployed and fully functioning** for 3 weeks on our production pool in the Technion



# Future development

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- HAD publishing in Collectors
  - condor\_status -had
- Accounting file replication
  - current solution is provided for NFS
- Software High Availability



# Collaboration with Condor team

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- Compliance with high Condor coding standards
- Peer-reviewed code
- Integration with NMI framework
- Automation of testing
- Open-minded attitude of Condor team to numerous requests and questions
- Unique experience of working with large peer-managed group of talented programmers



# Collaboration with Condor team

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This work was a collaborative effort of:

- **Distributed Systems Laboratory in Technion**

- Prof Assaf Schuster, Mark Silberstein, Gabi Kliot, Svetlana Kantorovitch, Dedi Carmeli, Artiom Sharov

- **Condor team**

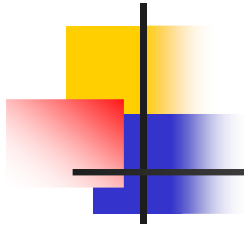
- Prof Miron Livni, Nick, Todd, Derek, Erik, Carey, Peter, Becky, Parag, Zack, Dan



# You should definitely try it !

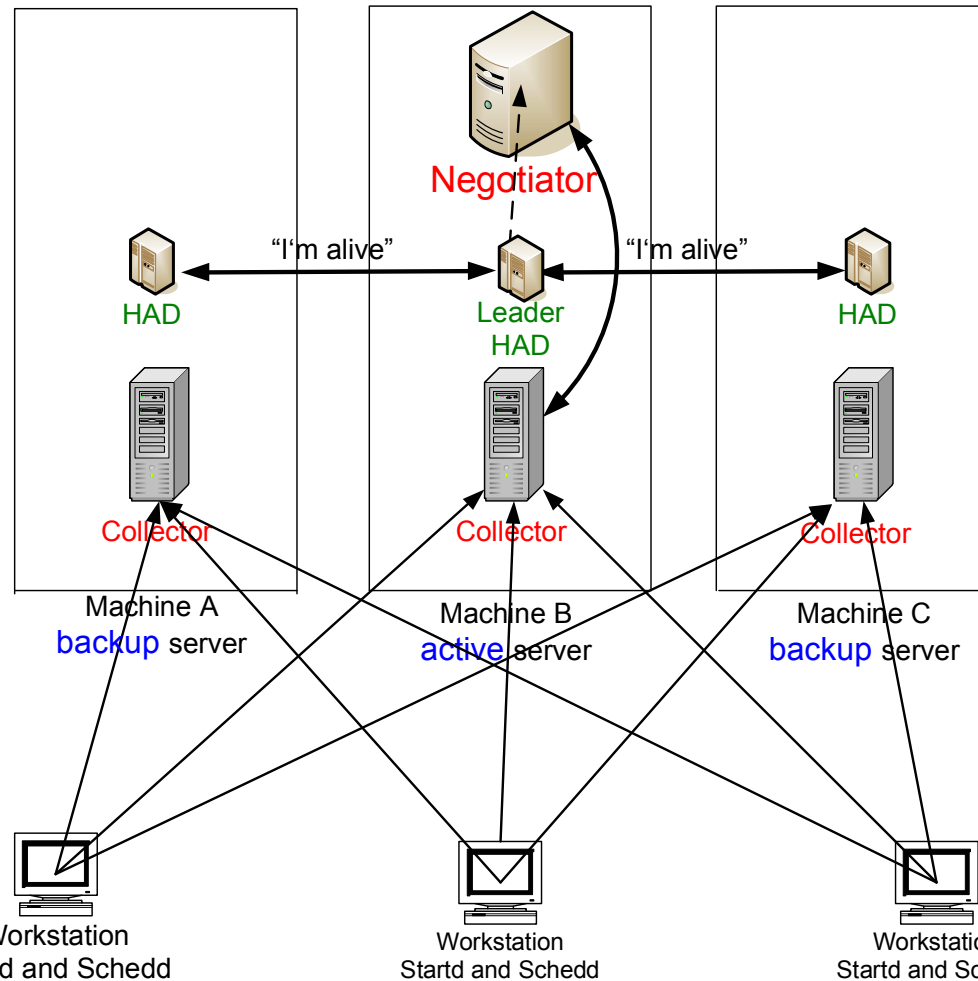
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- Part of the official 6.7.6 development release
- Full support by the Technion team
- More information:
  - [http://dsl.cs.technion.ac.il/projects/gozal/project\\_pages/ha/ha.html](http://dsl.cs.technion.ac.il/projects/gozal/project_pages/ha/ha.html)
  - more details + configuration on my tutorial tomorrow
- Contact:
  - [gabik@cs.technion.ac.il](mailto:gabik@cs.technion.ac.il)
  - [condor-users@cs.wisc.edu](mailto:condor-users@cs.wisc.edu)



# In case of time

# How it works – basic scenario







# Usability and administration

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- Configuration sanity check perl script
- Disable HAD perl script
- Detailed manual section
- Full support by Technion team