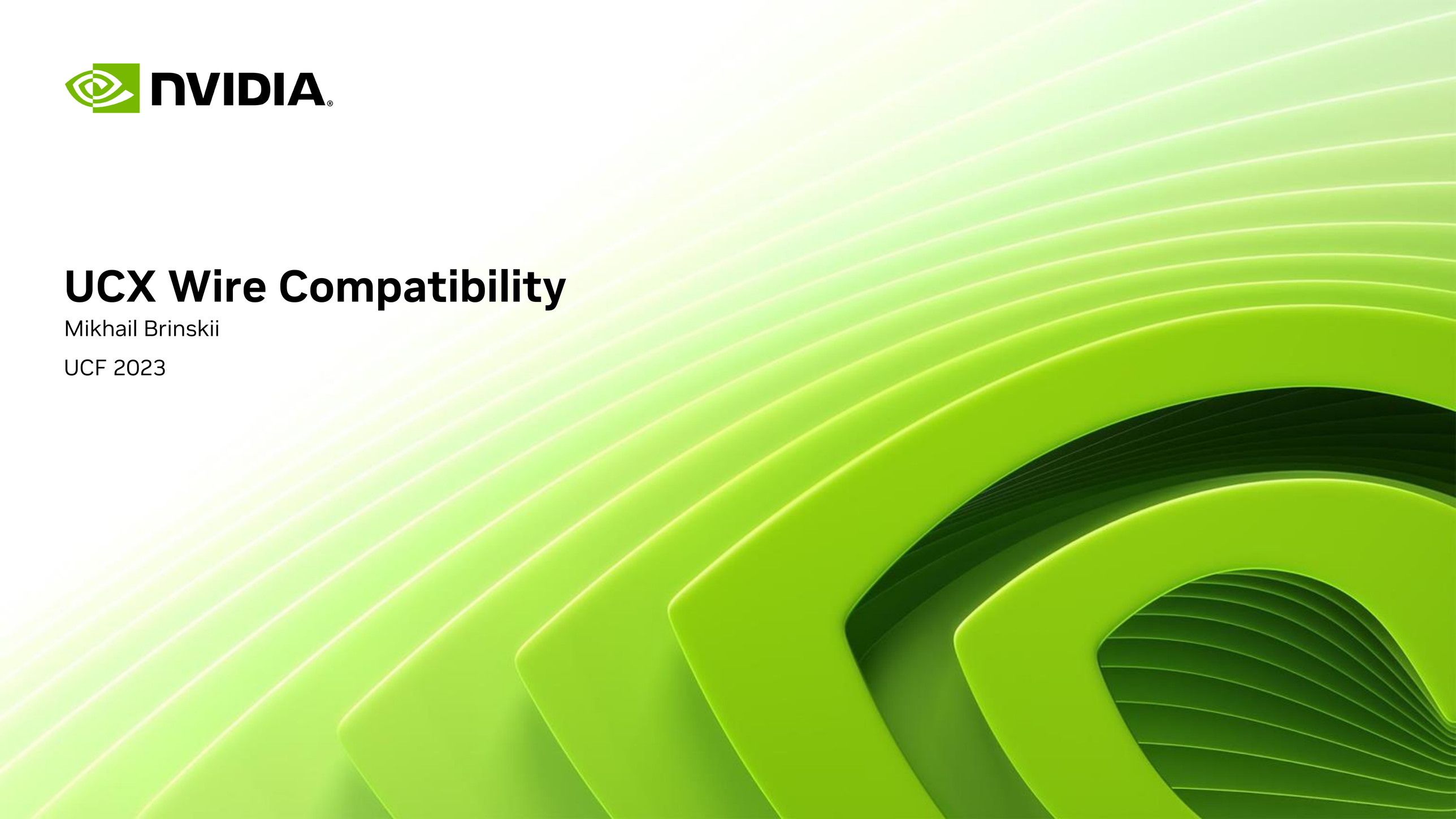

UCX Wire Compatibility

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Agenda

- Introduction
- UCP protocols compatibility
- Endpoint reconfiguration issues
- CI pipeline improvements
- Work in progress

UCX Wire Compatibility

Introduction

- Wire compatibility assumes that applications may use different versions of UCX library
- Important in cluster and cloud environments
- UCX is wire compatible since UCX v1.14.0
  - Limited compatibility since UCX v1.12.0 (only network transports and single device in CM flows)
- Currently up to four previous UCX versions supported
- Wire compatibility in UCX means:
  - Protocol headers are compatible
  - Connection establishment protocol is aligned
  - Configuration parameters have the same default values

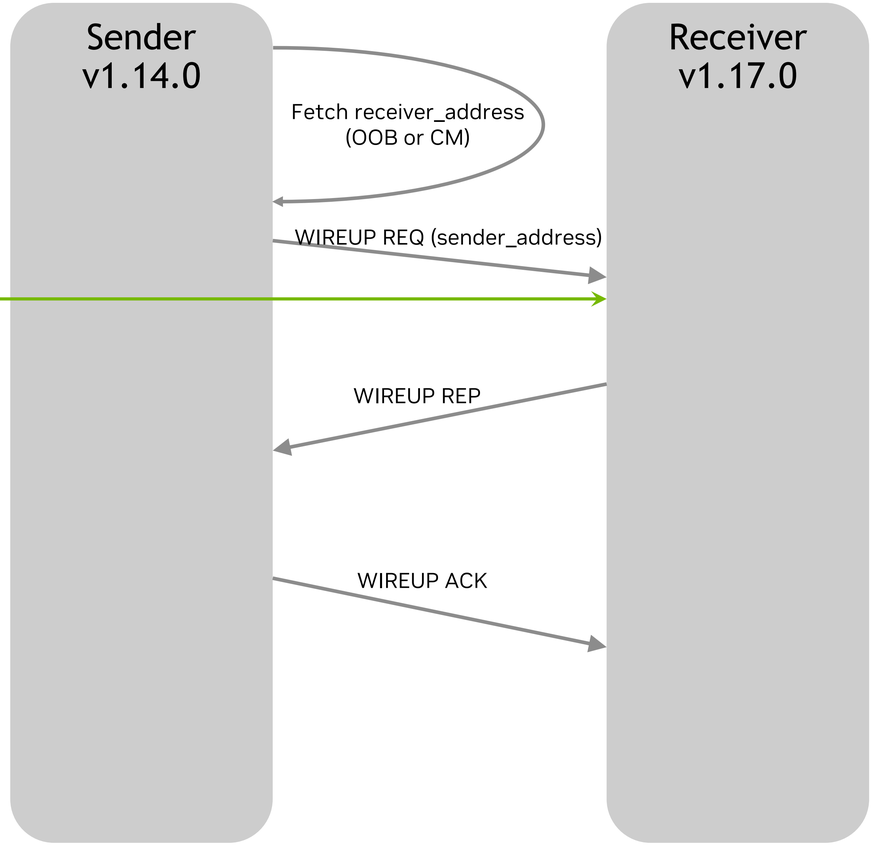
UCX Wire Compatibility

UCP protocols compatibility

- Peers always exchange worker addresses
  - Via OOB mechanism for connect to worker address flows
  - Via CM lane for connect to IP address flows

- Worker address contains UCX minor version
  - Packed in 4 bits, assuming no more than 8 previous versions supported
  - Starting from UCX v1.16
  - Older versions are packed as version 0 (i. e. legacy)

```
if (sender_address.version < 17) {
    initialize_old_protocols();
} else {
    /* Peer can parse newest protocol
     * headers!
     */
    initialize_new_protocols();
}
```

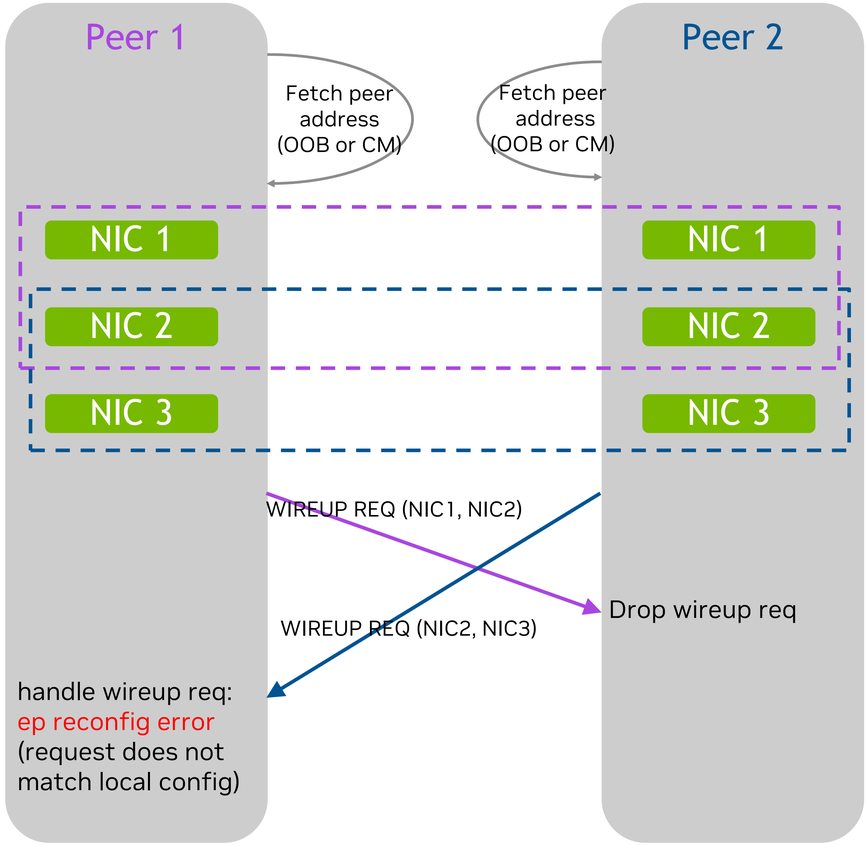


UCX Wire Compatibility

Endpoint reconfiguration issues

- Peers may initiate connection establishment simultaneously
- Connection establishment:
  - Select communication lanes based on local performance characteristics and initial peer address
  - Send wireup request with address containing selected lanes information
- Potential issues in head-to-head resolution:
  - Peer1 creates initial endpoint configuration
  - Peer2 also creates initial endpoint configuration
  - These configurations are different due to some reason

  (e. g. some performance value is calculated differently)
  - Peer1 attempts to handle wireup request from Peer2 but fails because the address in this request does not match the local endpoint configuration.



UCX Wire Compatibility

Endpoint reconfiguration issues

- Endpoint reconfiguration symptoms:

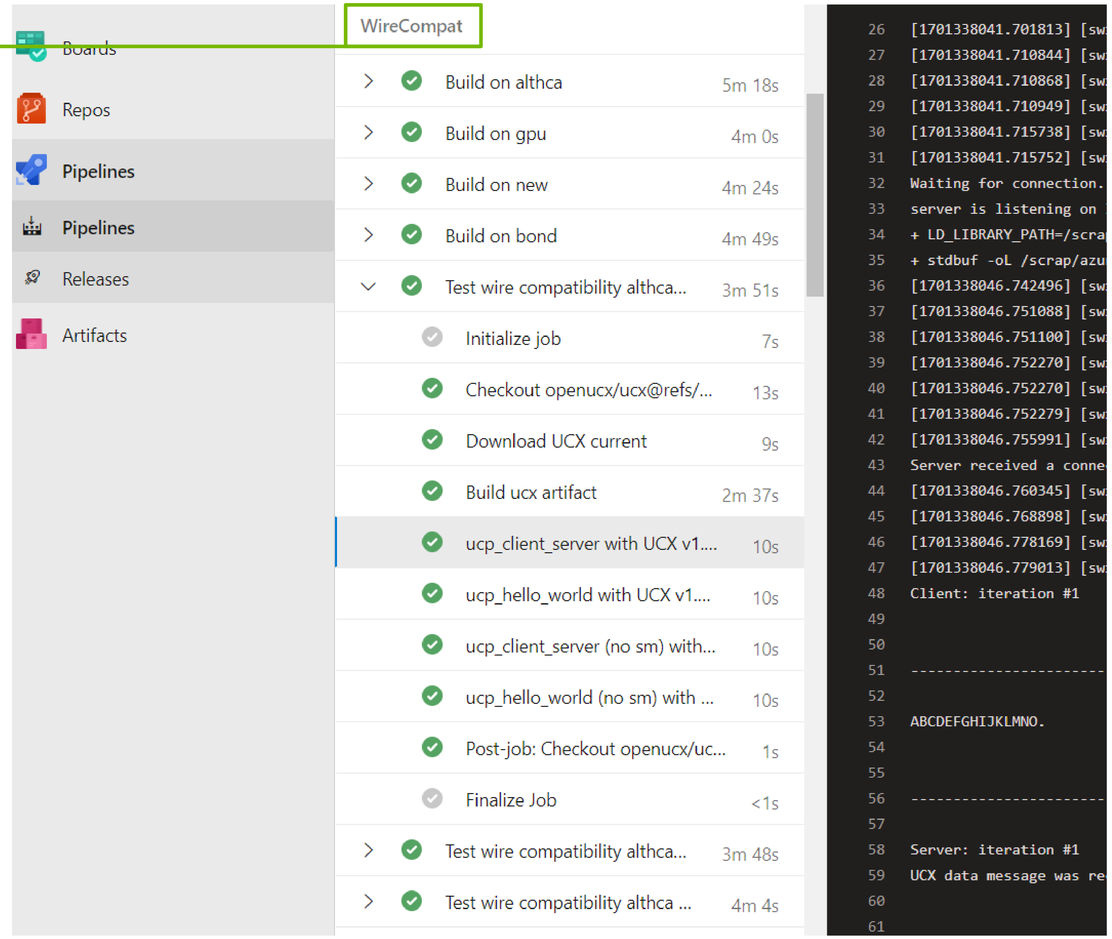
```
wireup.c:1554 Fatal: endpoint reconfiguration not supported yet

wireup.c:1204 UCX  ERROR   old: am_lane 0 wireup_msg_lane 6 cm_lane <none> keepalive_lane <none> reachable_mds 0x3fe
wireup.c:1214 UCX  ERROR   old: lane[0]:  7:sysv/memory.0 md[2]           -> md[2]/sysv/sysdev[255] am am_bw#0
wireup.c:1214 UCX  ERROR   old: lane[1]: 30:xpmem/memory.0 md[9]          -> md[9]/xpmem/sysdev[255] rkey_ptr
wireup.c:1214 UCX  ERROR   old: lane[2]: 11:rc_mlx5/mlx5_0:1.0 md[4]      -> md[4]/ib/sysdev[255] rma_bw#0
wireup.c:1214 UCX  ERROR   old: lane[3]: 26:rc_mlx5/mlx5_4:1.0 md[7]      -> md[7]/ib/sysdev[255] rma_bw#1
wireup.c:1214 UCX  ERROR   old: lane[4]: 29:cma/memory.0 md[8]            -> md[8]/cma/sysdev[255] rma_bw#2
wireup.c:1214 UCX  ERROR   old: lane[5]: 16:rc_mlx5/mlx5_2:1.0 md[5]      -> md[5]/ib/sysdev[255] rma_bw#3
wireup.c:1214 UCX  ERROR   old: lane[6]: 21:rc_mlx5/mlx5_3:1.0 md[6]      -> md[6]/ib/sysdev[255] rma_bw#4 wireup
wireup.c:1204 UCX  ERROR   new: am_lane 0 wireup_msg_lane 3 cm_lane <none> keepalive_lane <none> reachable_mds 0x3fe
wireup.c:1214 UCX  ERROR   new: lane[0]:  7:sysv/memory.0 md[2]           -> md[2]/sysv/sysdev[255] am am_bw#0
wireup.c:1214 UCX  ERROR   new: lane[1]: 30:xpmem/memory.0 md[9]          -> md[9]/xpmem/sysdev[255] rkey_ptr
wireup.c:1214 UCX  ERROR   new: lane[2]: 11:rc_mlx5/mlx5_0:1.0 md[4]      -> md[4]/ib/sysdev[255] rma_bw#0
wireup.c:1214 UCX  ERROR   new: lane[3]: 26:rc_mlx5/mlx5_4:1.0 md[7]      -> md[7]/ib/sysdev[255] rma_bw#1 wireup
```

- Endpoint reconfiguration GH issues:
  - https://github.com/openucx/ucx/issues/9159
  - https://github.com/openucx/ucx/issues/4160
  - etc

UCX Wire Compatibility

CI pipeline improvements

- New stage in CI PR pipeline
- Run ucp_client_server and ucp_hello_world examples:
  - With different UCX versions
  - On different setups
  - With different transports (network or shared memory)
- 1-line change is needed to add testing of new UCX version
- Wire compatibility stage is defined in:
  - https://github.com/openucx/ucx/blob/master/buildlib/pr/main.yml
  - https://github.com/openucx/ucx/blob/master/buildlib/pr/wire_compat.yml
  - https://github.com/openucx/ucx/blob/master/buildlib/tools/test_wire_compat.sh



UCX Wire Compatibility

Work In Progress

- Enhance wire compatibility CI testing: UCX PR #9460
  - CI check that different UCX versions use the same performance values for lanes selection
- Support endpoint reconfiguration: UCX PR #9234
  - Full support of head-to-head resolution of wireup requests
  - Update local endpoint configuration to match address in incoming wireup request