

<https://github.com/hrs-allbsd/syspack.git>

<https://people.allbsd.org/~hrs/FreeBSD/sato-20230519-syspack.pdf>

Syspack: Helper Toolkit for SysAdmin and Developers Based on BSD Make

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<https://github.com/hrs-allbsd/syspack.git>

<https://people.allbsd.org/~hrs/FreeBSD/sato-20230519-syspack.pdf>

Who Am I?

- **A researcher at Tokyo Tech, a FreeBSD committer since 2001**
- **Working on 10-100 FreeBSD machines at the university for purposes of:**
 - network services (web server, email server, etc.)
 - education (desktop, remote shell service)
 - software development (building and testing manually and/or in an automated manner)
 - experiments (building a system and running it on experimental hardware)

<https://github.com/hrs-allbsd/syspack.git>

<https://people.allbsd.org/~hrs/FreeBSD/sato-20230519-syspack.pdf>

Motivation

- **A lot of customized systems at various levels:**
 - Vanilla FreeBSD releases + configuration files
 - Patched kernel
 - A system as the development target
 - Non-FreeBSD systems
 - Various lifetimes; 1 hour to 3+ years
- **Pain points are:**
 1. Tracking/recoding the necessary modifications to build or duplicate a system
 2. Deployment of a system
 3. Iteration process of trial-and-errors when developing/configuring a system

<https://github.com/hrs-allbsd/syspack.git>

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Motivation

- **Pain points are:**

1. Tracking/recoding the necessary modifications to build or duplicate a system
2. Deployment of a system
3. Iteration process of trial-and-errors when developing/configuring a system

1. Version control systems, such as Git, Subversion, CVS, ...?
2. Deployment automation tools, such as Ansible, Puppet, Chef, ...?
3. Manual process?

<https://github.com/hrs-allbsd/syspack.git>

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Syspack

- **No intention at all to replace these brilliant software!**
- Syspack is a ports/pkgsrc-like approach to the management of configuration files and customized system images
 - The ports/pkgsrc framework is designed to provide consistency in fetching the source files, building, installing, and packaging them

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Syspack

Example: shells/dash in FreeBSD Ports Collection

```
PORTNAME=      dash
PORTVERSION=   0.5.12
CATEGORIES=    shells
MASTER_SITES= http://gondor.apana.org.au/~herbert/dash/
              files/

MAINTAINER=    bdrewery@FreeBSD.org
COMMENT=       POSIX-compliant implementation of /bin/sh
WWW=           http://gondor.apana.org.au/~herbert/dash/
...

```

- Based on BSD Make
- "A wrapper" of the operations required to install software

<https://github.com/hrs-allbsd/syspack.git>

<https://people.allbsd.org/~hrs/FreeBSD/sato-20230519-syspack.pdf>

Goals

- **A ports/pkgsrc-like approach to the management of configuration files and customized system images**
 1. **Non-intrusive:** You can use syspack in combination with your own machine/file management workflow
 2. **Scalable:** You can get started even with management of a single file
 3. **Flexible:** Also helpful for the modification-build-test iteration process of kernel/userland software development
 4. **Extensible:** You can add a function easily because of the modular structure

Developed for a proprietary software project, but being reimplemented to make it open.

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Why BSD Make?

- Shell scripts for organizing procedures are more difficult to maintain. For less complexity and more reusability, I needed
 - Idempotency
 - Declarative descriptions (e.g., simple key-value pairs or correspondences between files, not procedure) of the configuration
- `make(1)` is designed for this kind of jobs.
- And many deployment automation software has reinvented the same conclusion.

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<https://people.allbsd.org/~hrs/FreeBSD/sato-20230519-syspack.pdf>

Configuration File Management

Configuration File Management

```
example.org
| simple
| | --Makefile
| | --Makefile.inc
| | --etc
| | | --Makefile
| | | --rc.conf
```

- **Available Make Targets on `example.org/simple/etc`:**

- Install rc.conf to /etc:

```
% sudo make install
```

- Compare rc.conf and /etc/rc.conf:

```
% make status
```

- Check the difference between the two:

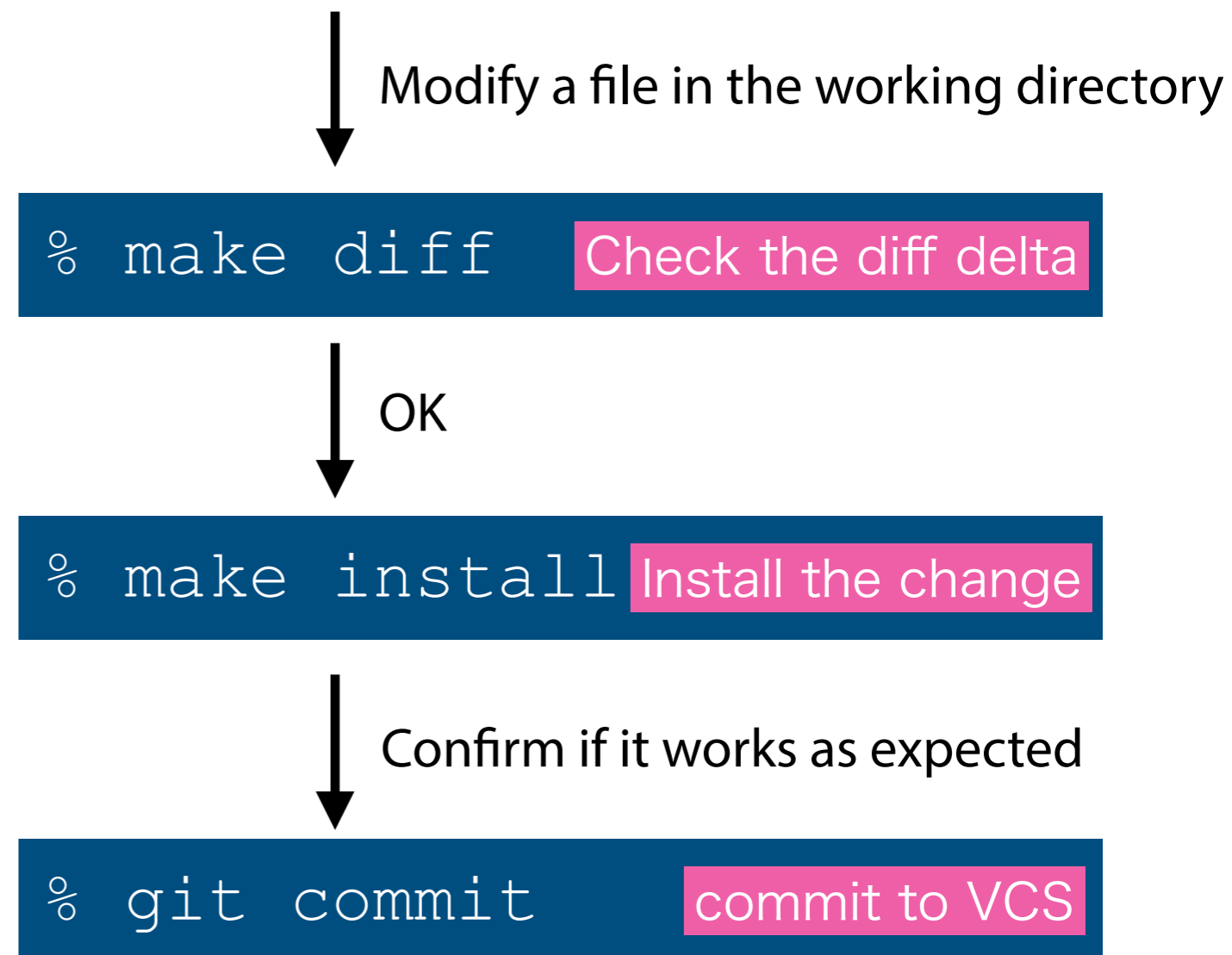
```
% make diff
```


Management Workflow

example.org

```
| simple  
| | --Makefile  
| | --Makefile.inc  
| | --etc  
| | | --Makefile  
| | | --fstab  
| | | --rc.conf  
| | | --resolv.conf  
| | --usr.local.etc  
| | | --Makefile  
| | | --Makefile.inc  
| | | --console.cf  
| | --usr.src.sys.amd64.conf  
| | | --Makefile  
| | | --SIMPLE
```

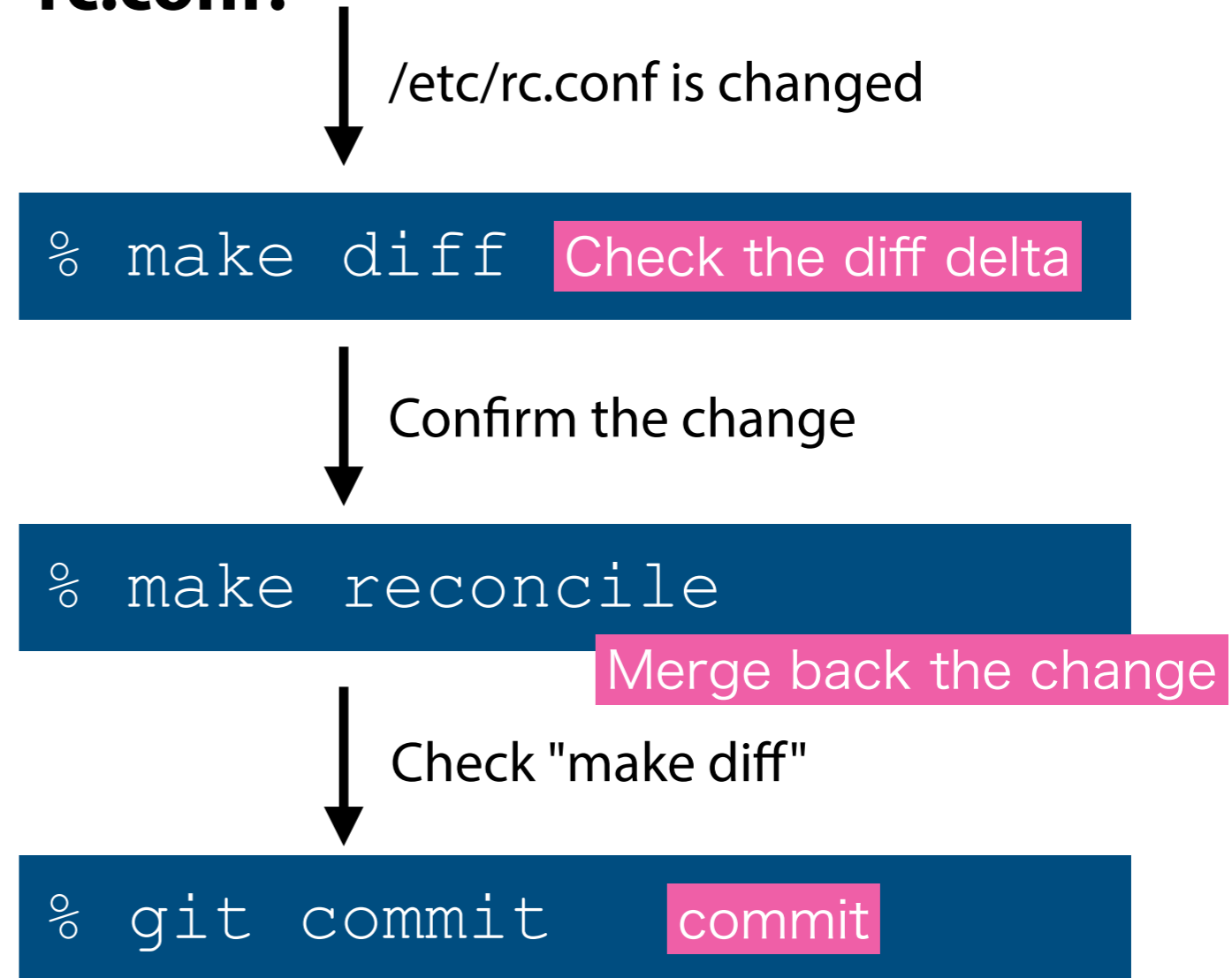
- **When adding a change:**



Management Workflow

```
example.org
| simple
| | --Makefile
| | --Makefile.inc
| | --etc
| | | --Makefile
| | | --fstab
| | | --rc.conf
| | | --resolv.conf
| | --usr.local.etc
| | | --Makefile
| | | --Makefile.inc
| | | --console.cf
| | --usr.src.sys.amd64.conf
| | | --Makefile
| | | --SIMPLE
```

- **When directly modifying /etc/rc.conf:**



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More Files

```
example.org
| simple
| | --Makefile
| | --Makefile.inc
| | --etc
| | | --Makefile
| | | --fstab
| | | --rc.conf
| | | --resolv.conf
```

- **Permissions, owner, and group**

- FILESDIR_{OWN,GRP,MODE}
- FILES{OWN,GRP,MODE}
- FILES{OWN,GRP,MODE}_{filename}

```
FILESDIR= /etc
FILESDIR_MODE= 0775

FILES=      rc.conf \
           resolve.conf
FILESGRP_rc.conf= daemon

.include <bsd.prog.mk>
```

```
% git clone https://github.com/hrs-allbsd/syspack.git
```


<https://github.com/hrs-allbsd/syspack.git>

<https://people.allbsd.org/~hrs/FreeBSD/sato-2021-01-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000>

AVAILABLE ON GITHUB

Management Workflow

- change rc.conf
- make diff
- make install
- make reconcile
- single file operation

DEMO

<https://github.com/hrs-allbsd/syspack.git>

<https://people.allbsd.org/~hrs/FreeBSD/sato-2021-07-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000>

AVAILABLE ON GITHUB

Plugin Structure

```
% cd syspack/config/mk && ls
```

```
bsd.config.mk main mk file
```

```
doc/
```

```
platform.common/
```

```
platform.freebsd/
```

```
platform.linux/
```

```
platform.sunos/
```

```
spx/
```

```
% cd platform.common && ls
```

```
backup.g.mk
```

```
backup.mk
```

```
check.mk
```

```
diff.f.mk
```

```
diff.mk
```

```
fetch.f.mk per-target mk files as plugin collection
```

```
fetch.mk
```

```
install.f.mk
```

```
install.mk
```

```
krb5princ.f.mk
```

```
krb5princ.mk
```

```
logging.mk
```

```
...
```

Start/Stop A Service

- SERVICES in etc/Makefile
- make start, stop, restart
- make {action}-{service}

```
example.org
| simple
| | --Makefile
| | --Makefile.inc
| | --etc
| | | --Makefile
| | | --fstab
| | | --rc.conf
| | | --resolv.conf
| --usr.local.etc
| | --Makefile
| | --Makefile.inc
| | --console.cf
| --usr.src.sys.amd64.conf
| | --Makefile
| | --SIMPLE
```

```
FILES_DIRS= /etc
FILES=      rc.conf \
            resolv.conf \
            syslog.conf \
            ntp.conf

SERVICES=  syslogd ntpd

.include <bsd.prog.mk>
```


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System Image Building and Deployment

Build and Install A World

```
example.org
| simple
| | --Makefile
| | --Makefile.inc
| | --etc
| | | --Makefile
| | | --fstab
| | | --rc.conf
| | | --resolv.conf
```

- **WORLD plugin:**
make world-fetch, buildworld, buildkernel
installworld
- Define WORLD_SRCDIR and see the results of "make targets/vars"
- .spx/world/* is used as the directory for source files, obj, log files when "@" is specified

```
SUBDIR=      etc

WORLD_SRCDIR=  @/src
WORLD_TAG=    releng/13.2
WORLD_DESTDIR= /R/13.2

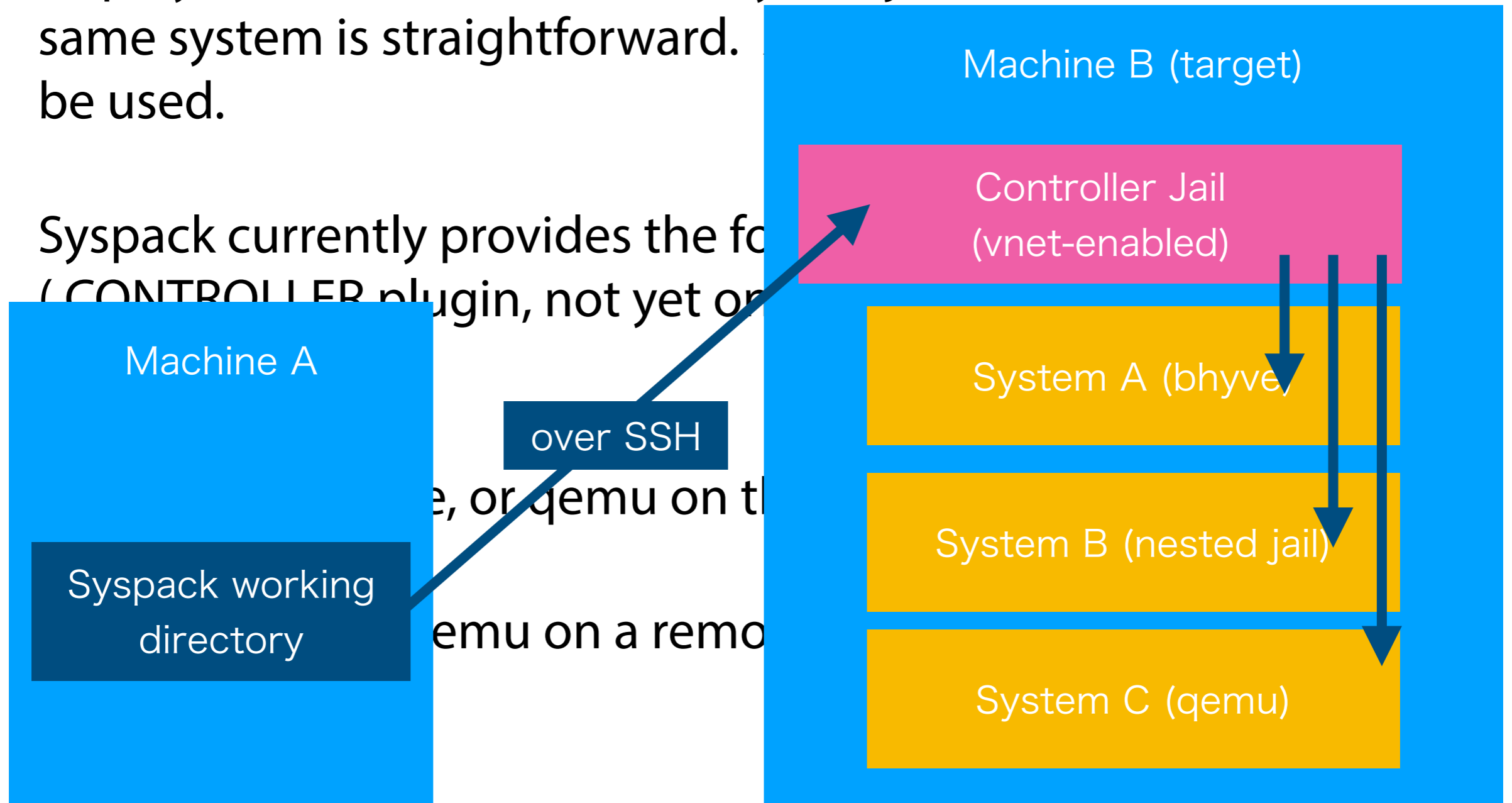
.include <bsd.prog.mk>
```


Deployment

- Deployment to the root directory or a jail environment on the same system is straightforward. Any jail management tool can be used.
- Syspack currently provides the following options (CONTROLLER plugin, not yet on github repo right now but added soon):
 - local, jail, bhyve, or qemu on the same system.
 - jail, bhyve, or qemu on a remote FreeBSD system.

Deployment

- Deployment to the root directory or a jail environment on the same system is straightforward. `syspack` can be used.
- `syspack` currently provides the following deployment options (CONTROLLER plugin, not yet on master):
 - `syspack` over SSH
 - `syspack` over qemu on the same system
 - `syspack` over qemu on a remote system



<https://github.com/hrs-allbsd/syspack.git>

<https://people.allbsd.org/~hrs/FreeBSD/sa>

NOT AVAILABLE ON GITHUB YET

Packing the Images

- The following options are available (SYSIMAGE plugin):
 - Tarballs like FreeBSD release distributions
 - Bootable image in ISO9660 and virtual machine formats
 - Filesystem image (UFS and ZFS send stream)

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<https://people.allbsd.org/~hrs/FreeBSD/sato-20230519-syspack.pdf>

Applications

<https://github.com/hrs-allbsd/syspack.git>

<https://people.allbsd.org/~hrs/FreeBSD/sato-20230519-syspack.pdf>

Applications

- **Management of configuration files on a local system:**
 - Makes the "Modify, activate the service, check the log" cycle easier.
- **Kernel development that requires modify-build-and-run cycles:**
 - The make world-fetch, buildworld, and the bhyve deployment option on the same and remote machine greatly improved the students' on-boarding experience.
- **Organizing system configurations for automated testing**
 - Deploying and destroying a system even for a very short time is easy to handle

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TODO

- Almost no documentation right now. Github repo will be updated soon.
- Support of packing application-level set of configurations (APP plugin), not only machine-level (WORLD plugin):
 - E.g., An email server = multiple 3rd party software + configuration files.
 - Make it run in a sandboxed environment on a remote machine.
- Non-BSD system support. Working on Solaris 7/SPARC(!) and Linux for portability and wider applicability.
- Please send feedback to me if you are interested in it.

<https://github.com/hrs-allbsd/syspack.git>

<https://people.allbsd.org/~hrs/FreeBSD/sato-20230519-syspack.pdf>

Questions/Comments/ Suggestions?

Please send your feedback to hrs@FreeBSD.org or Github repo