eCompliance:
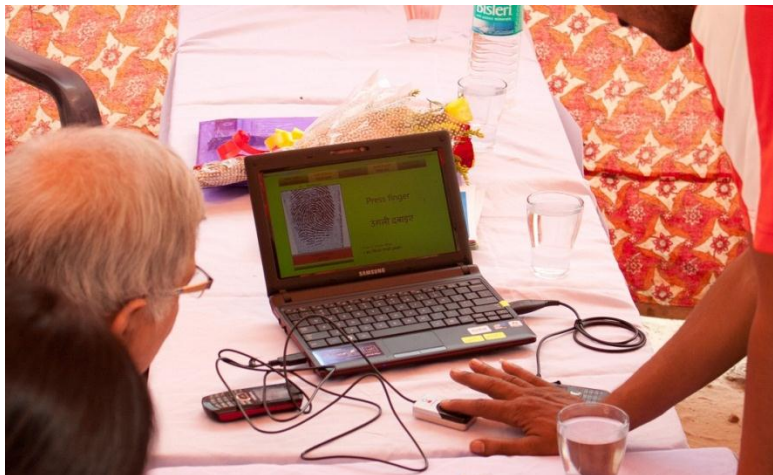# Revolutionizing Tuberculosis Treatment

Operation **ASHA**
Fighting Tuberculosis Worldwide

Designed in collaboration with:

**Microsoft Research India & Innovators In Health**

Overview

Operation ASHA is a non-profit bringing tuberculosis treatment to more than 5 million of India and Cambodia's poorest.

eCompliance is a biometric terminal that contributes to preventing drug-resistant strains of tuberculosis from developing during patient treatment.

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The Problem
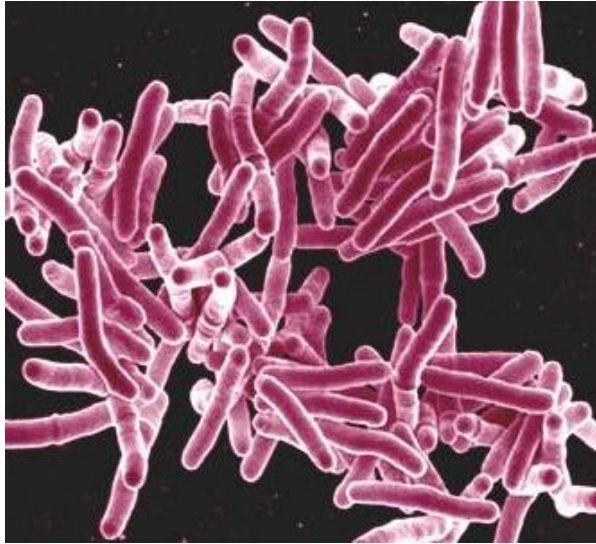
Tuberculosis (TB) is an airborne bacterial contagion that typically infects the lungs. Annually, an estimated 1.4 million people die of TB, equal to more than 3,800 deaths per day.

Drug-Resistant TB develops when patients stop taking their medicines partway through the 6-9 month treatment. Drug-resistant strains are as highly contagious as non drug-resistant strains of TB.

Tuberculosis in India

Drug Resistance in India

There are over **100,000** estimated cases of drug resistant TB in India although less than 3,000 were identified in the same year.

12 cases of extremely drug resistant TB were recently found in India. These cases had developed to the extent that no known drug could cure it.

In a recent study, only 3 out of 106 practitioners issued an appropriate prescription for drug resistant TB

India has 3.5 million TB patients, 25% of the world's total burden.

100,000 infected women are thrown out by families to die of disease and starvation

2 persons die of disease every 3 minutes in India

Lost wages: $300 million/year; Total loss to Indian economy: $ 23 billion/year. *

300,000 children drop out of school because they, or a parent, have TB.
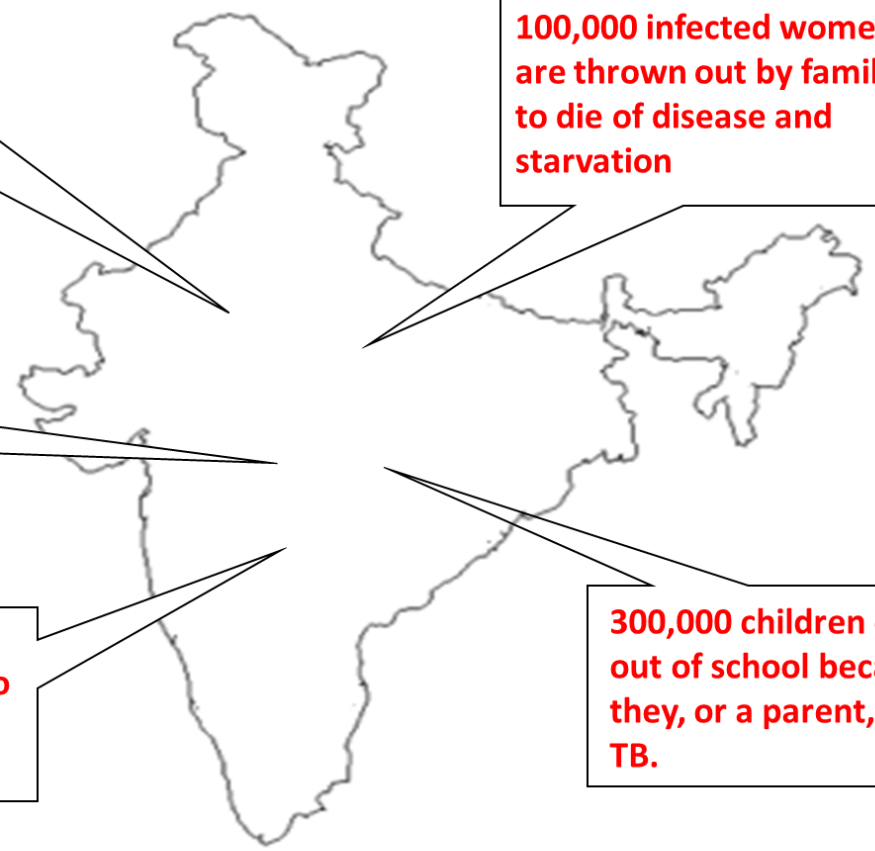
* TB India 2007, Government Of India, Mar2007

Drug-Resistant Tuberculosis

Ineffective TB programs have turned drug-resistant TB into an epidemic. Because medicines are <u>50-200 times more expensive</u>, drug resistance has turned a curable disease into a death warrant for those who live below the poverty line.

MDR-TB
- Is not susceptible to one or more of the first-line TB drugs
- Comprises 5-10% of the total TB cases
- Has an approximate mortality rate of 80 percent

XDR-TB
- Develops when patients default on MDR-TB treatment
- Comprises 20-25% of the total MDR-TB cases
- Nearly 100% mortality, especially in developing countries

XXDR-TB
- Is unresponsive to all known TB medicines
- It was recently discovered in Mumbai, India. Twelve cases of this strain were identified, and three have died.
- There is <u>currently no way to cure this disease</u> although it can be directly transferred to anyone

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Failures in the Current Treatment

Directly Observed Therapy (DOTS) is the accepted standard of TB treatment. DOTS requires every patient to come into a TB center to take their medicines in front of a health worker.

DOTS-
sure cure for TB.
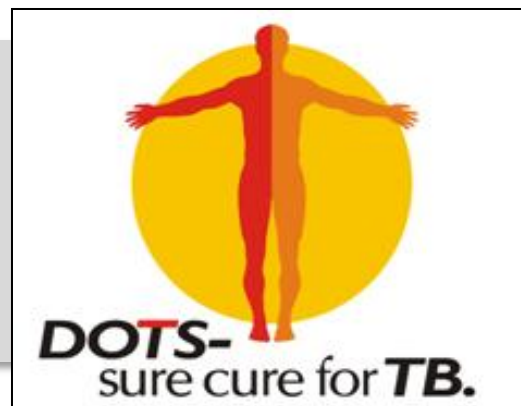
"DOTS alone is not sufficient to curb the TB epidemic in countries with high rates of MDR-TB" –Stop TB Working Group

Failures
1. DOTS cannot reach the "last mile" patients in slums and villages
2. DOTS cannot verify patients' attendance
3. DOTS has a slow response time when a patient misses a dose
4. DOTS lacks a central or digitized attendance database

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Operation ASHA's Solution

To combat TB and the rise of MDR-TB, OpASHA has established TB centers in underserved areas, hired local community members, and implemented eCompliance biometric terminals.

OpASHA strategically locates TB centers in convenient, high-traffic areas within slums and villages. All centers are operated out of existing clinics, temples, and businesses.

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Operation ASHA's Solution

Local Community Members are hired as counselors to treat TB and detect new patients. Because they are familiar with the local customs, geography, and informal address systems, these individuals effectively fight TB in their communities.

Specialized Training teaches health workers to detect TB patients, conduct health awareness programs, and provide counseling to ensure adherence to the treatment regimen.

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eCompliance

Operation ASHA has developed eCompliance with *Microsoft Research* and *Innovators in Health* to reliably track and report each dose that a patient takes. It is an open-source software that runs on commercially available, 'off-the-shelf' components.
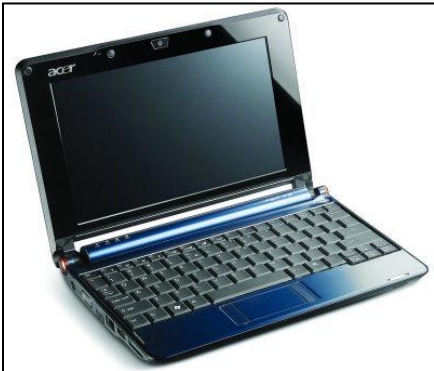
Netbook Computer

Fingerprint Reader

SMS Modem

eCompliance

Patients are registered on the system using the fingerprint scanner. Each time the patient returns to the center for their scheduled visit, they scan their finger at the terminal. This creates a verifiable log of patients who were present for treatment.

Benefits

- Halts the Development of MDR-TB
- Accurate & real-time reporting for transparent supervision
  - Eliminates human error
  - Prevents Tampering
- Attendance logs quickly inform health workers of patients who still need to come into the center

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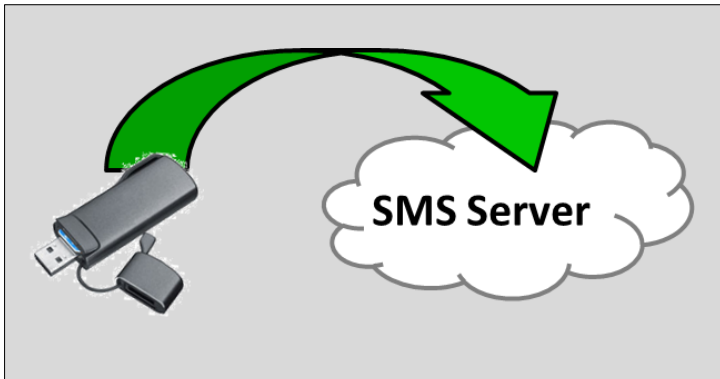
Features of eCompliance

- Color coding shows that a patient has been successfully logged in

- The simple interface uses a minimal amount of text

- Easily translatable into other languages

Counselors can quickly identify which patients have

- visited the center
- not come into the center
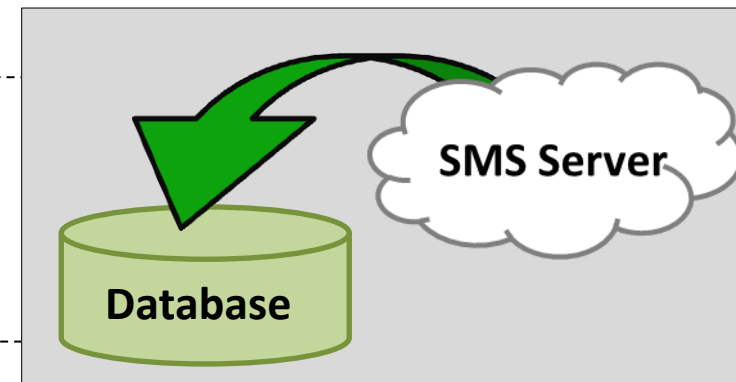- missed their dose within 48 hours

eCompliance

Every evening, the eCompliance terminal sends the day's attendance log via SMS to an online SMS server. This server acts as an online phone.

The text messages are downloaded from the SMS server and imported into a centralized online database.

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eCompliance

If there are any missed doses that day, separate text messages are sent to the counselor and the program manager. This informs them that a follow up visit is required within 48 hours.

The health worker will then take a terminal to the missed dose patient's home. She will deliver the medicines along with counseling and scan the patient's fingerprint as proof of the visit.

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Sample eCompliance Report

The eCompliance reporting system automatically generates in-depth analyses and up-to-date performance information. This data is available to program managers and operational management.

State Wise Monthly Outcome Report - Internal

For the month of: December 2011				Frequency: Monthly		State:Delhi		
	Cured	Treatment Complete	Default	Failure	Died	Transfer Out	Total	Percentage
CAT I	36	88	1	1	3	1	130	100
CAT II	0	0	0	0	0	0	0	0
Total	36	88	1	1	3	1	130	100
Percentage	27.69%	67.69%	0.76%	0.76%	2.3%	0.76%	100%	

Summary	
Treatment Success Rate:	95%

Patient	Treatment Start Date	Outcome Date	Outcome
Jan Mohd	21/05/2011	06/12/2011	Treatment Complete
Poonam	09/06/2011	06/12/2011	Treatment Complete
Akash	20/08/2011	06/12/2011	Cured
Mehraj	20/08/2011	06/12/2011	Treatment Complete
Mahesh	01/06/2011	30/12/2011	Default
Motiram	10/06/2011	02/12/2011	Cured
Bhole	13/06/2011	05/12/2011	Treatment Complete
Rehbar	15/07/2011	09/12/2011	Treatment Complete
Nisha	20/07/2011	28/12/2011	Cured
Kusum	22/07/2011	30/12/2011	Treatment Complete
Babita	22/07/2011	30/12/2011	Treatment Complete
Gulab Singh	25/07/2011	14/12/2011	Treatment Complete
Dhan Raj	01/08/2011	30/12/2011	Cured
Neha	01/08/2011	05/12/2011	Died
Mangat Ram	19/01/2011	05/12/2011	Cured

Operation ASHA - eCompliance Guru   1 - 5   1/30/2012 9:57:17 PM

List of eCompliance Reports

- Missed Dose Report
- Outcome Report
- Summary Report
- Chemoprophylaxis Report
- Conversion Report
- Conversion of NSP Cases
- Conversion of SP Cases
- Extension Report
- New Sputum Positive Cases
- Sputum Positive Cases Cat II
- DOTS Centres CDP Details
- DOTS Centres Expansion Report
- MDR Suspected Report
- TB Number Application Report

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14

Common Solutions

A common solution to fighting TB has been to simply increase staff and supervision.

However, this solution has failed because it cannot
- Stop absenteeism
- Reduce travel distance for patients
- Improve counseling & health education
- Verify the accuracy of data

Operation ASHA has solved these issues through eCompliance

- Absenteeism is prevented through biometrics
- Centers are conveniently established near patients
- Counseling is quickly focused on patients who miss doses
- Biometrics verifies that patients have come to the center
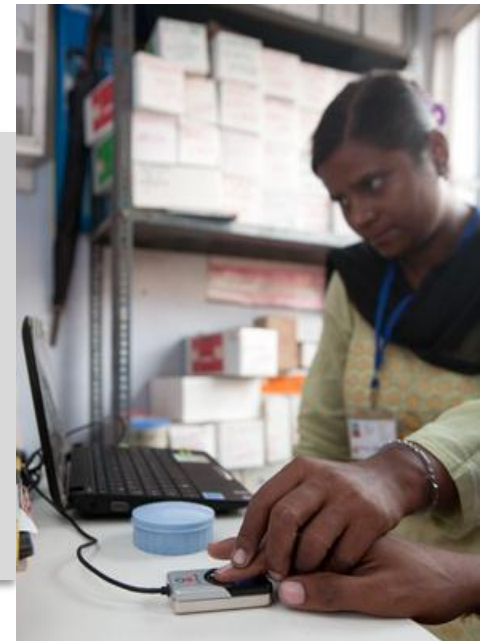
Implementation

Results

- Default reduced to **1.5%**
- Over **1,400** patient cured
- Over **60,000** visits logged

Lessons Learned

Our experience indicates that patients are not hesitant to give their fingerprints, and usually do so without difficulty

Patients have perceived the use of technology as a sign of the quality of treatment they are receiving

26 eCompliance terminals have been used in South Delhi since 2009

14 more terminals were installed in Jaipur in 2011

Cost Effectiveness

Component	Cost
Netbook Computer	$ 290 (Rs. 14,500)
Fingerprint Reader	$ 64 (Rs. 3,200)
SMS Modem	$ 28 (Rs. 1,400)
SMS Plan (per year)	$ 4 (Rs. 200)

The total cost of each eCompliance terminal is **less than $400 (Rs. 20,000)**

The increased cost per patient came out to **$2.50 (Rs. 120).**

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The way ahead……

We are proposing three modifications to improve the effectiveness of eCompliance

1. Change the user interface to an image oriented interface

2. Transition to a smartphone operating system

3. Add the ability to track MDR-TB patients

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Why Text Free?

- More than 42 languages, 420 dialects spoken in India, 4000 in Africa

- Tribal areas use a primitive spoken dialect, with no formal script or grammar

- Each tribal area has different language

- Cognitive abilities depend on environment and stimuli to the brain(visual, auditory, tactile, sensory)

- Cognitive level is therefore far lower in uneducated, unexposed tribal than slum dwellers

Image Based User Interface

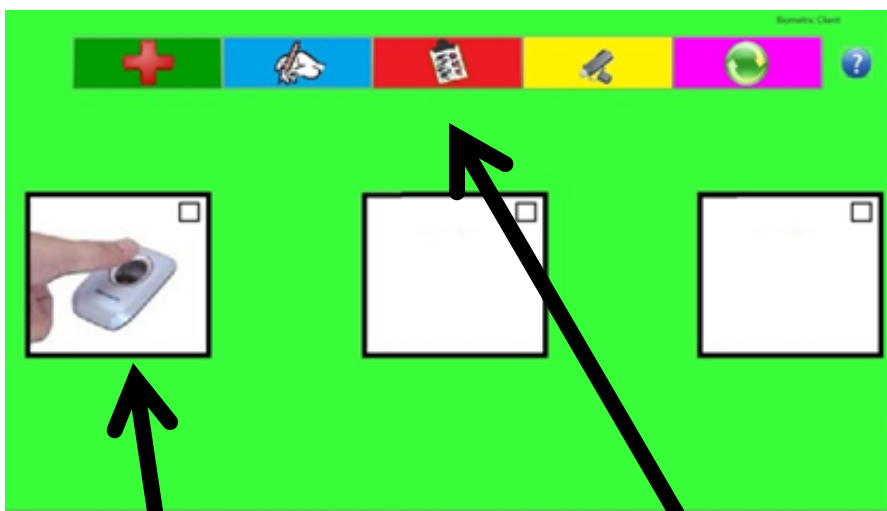**Current eCompliance Interface**   **Upgraded eCompliance Interface**
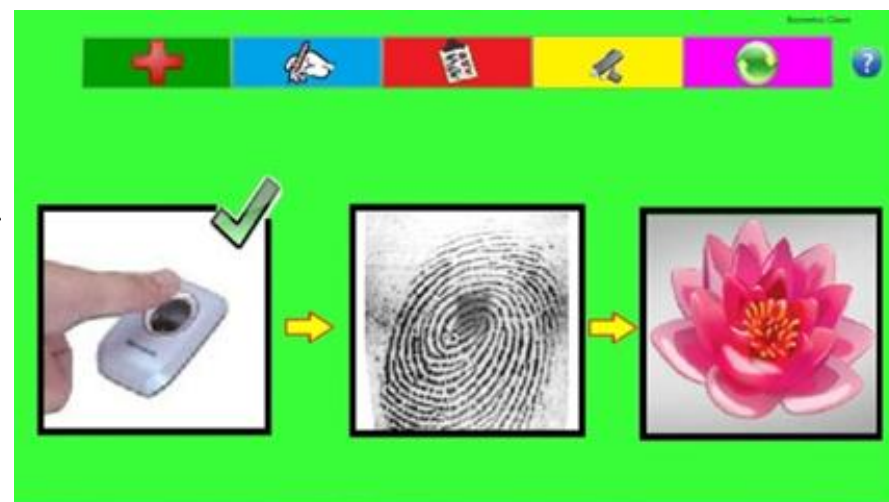
Aim- To effectively bring biometric TB treatment to zero literacy areas

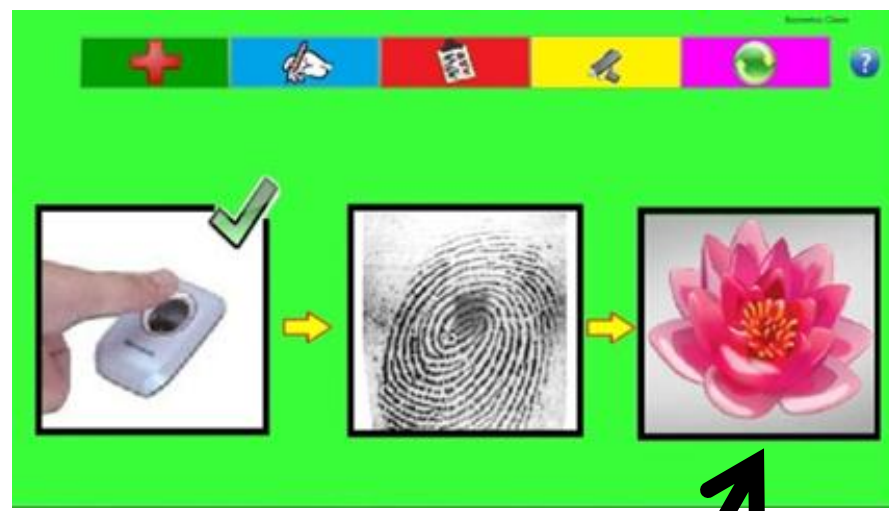# Image Based User Interface

Before Patient Logs In

After Patient Logs In

Images will clearly explain basic system processes

All text icons will be replaced with images depicting the button functions

When a patient logs in, an assigned picture will pop-up. The counselor will then retrieve the box with the corresponding sticker.

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2. Transition to Smartphones

Specs

Operating System: Android 2.3.4 or higher

Fingerprint Reader: Digital Persona U.are.U 5100

Fingerprint Software: FingerJet OEM

Benefits

- Smartphones reduce the cost of the device by over 40%
- Increased portability
- Intuitive touch screen is easier for low literacy users
- Spreads mobile technology to disadvantaged areas
- Easily and freely downloadable by others in the health sector

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Op ASHA

Modification needed to track MDR-TB

Modifications Needed

- Link up to two years treatment regimen to existing database
- Track regular tests (smear, cultures LFT and KFT)
- Track patients who miss doses, tests, hospital visits
- Identical source code
- Similar software algorithms.

Benefits

- Increase of cure rates among MDR-TB patients
- Halt default
- Prevents mutation of MDR to XDR and XXDR
- Prevents further spread in poor communities

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Conclusion

eCompliance should become the new internationally-recognized standard in tuberculosis control.

It is the most reliable method of tracking treatment default, and has the potential to halt the exponential growth of drug-resistant TB.

Please visit www.opasha.org for more information about our model, our current work, and other projects.

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